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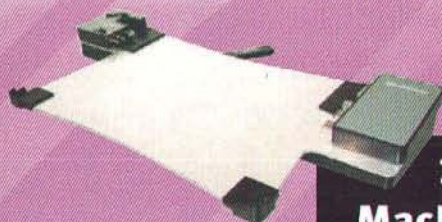
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From the Editor

Welcome to the March issue of MacTech magazine. Right away, I need to thank *everyone* involved with this publication. We've been getting absolutely great feedback from readers. Also, as an organization, MacTech has been firing on more cylinders than ever before. Of course, the authors need thanks as the content has been wowing everyone – myself included! This month is no different, and I personally have to thank the authors involved in March as there were some short turnaround times for the articles, and everyone is still getting over their Macworld hangover! Contributors this month all picked topics that they were passionate about, and it shows. This leads me to two things.

First, I'm really thrilled to welcome **Jeffrey Rochin** to the MacTech staff. A former "formal" educator – chemistry, physics and Science Department Chairman – Jeffrey brings a lot to his role at MacTech. He's listed on the masthead as a "Staff Writer" which means helping with reviews and other articles, but he'll also be helping out various ways in our production process, helping catch all of those little errors before they get to the printer. He is a long time Apple Consultants Network member, has been using Apple products since the IIs, and currently runs a consulting practice out of the San Jose, California area. Welcome, Jeff, and we all look forward to the improvements and knowledge you bring!

Second, it's back to the authors! We're thrilled that author **Dean Shavit** was not only able to write an article about the new **MacFUSE**, but also interview **Amit Singh** who ported it to the Mac. Check inside for extensive MacFUSE coverage.

From there, we have two other returning authors that made their first appearance in February: **Ben Greisler** and **Allen Hancock**. Ben brings us the basics of IP failover. Did you know this high availability feature comes standard with OS X Server? Ben leads the way there. Allen, on the other hand, talks about the software that makes him more productive. Learn the tips and tricks here that will make *your* Mac life easier as well.

Philip Rinehart from Yale University and the MacEnterprise Project brings us a comparison of the major means of virtualization on the Mac today: Parallels and VMware, with a little Crossover thrown in for good measure. Virtualization is hot, but how do you choose the right solution? Check out "**Virtual Reality**" to help with that decision.

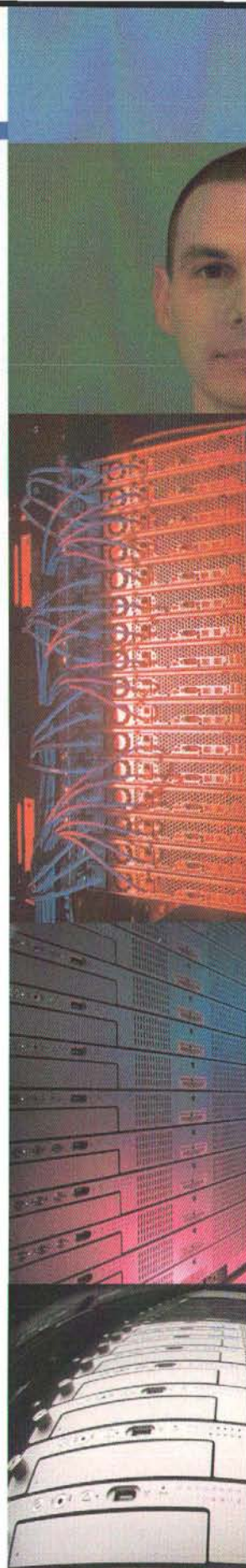
An author from a different University, **Criss Meyers**, writes about the differences in the Apple Partition Map (APM) partitioning scheme versus the newer GUID Partition Table (GPT). Didn't know your new Intel Mac was using anything different? See what GPT brings to the table.

As always, you'll find **Kool Tools** reviews, **Ben Waldie's AppleScripting** column, along with **Mac In The Shell** and our third installment of the **MacTech Spotlight**: this month, we're featuring **Tim Standing** from **SoftRAID**. Tim's article in January, "Using RAID as Backup" has gotten an amazing response, both through the magazine, and from people contacting him directly! He took some extra time out to share with us how he started, what keeps him going now, and what it's like to have to program after pulling someone out of a burning building.

Third, I want to mention that the authors that grace these pages, and many subscribers to MacTech are some of the most influential in the Macintosh universe. Do you know who the most influential people are? We could take a guess or two, but we want *you* to tell *us*! Vote on-line in the second annual MacTech 25, which highlights the 25 most influential technical people in the Mac community. Find out more and place your votes at <http://www.mactech.com/mostinfluential/>.

Enjoy the issue, and remember: never hesitate to contact us with questions, comments and ideas! We're listening at feedback@mactech.com. See you next month!

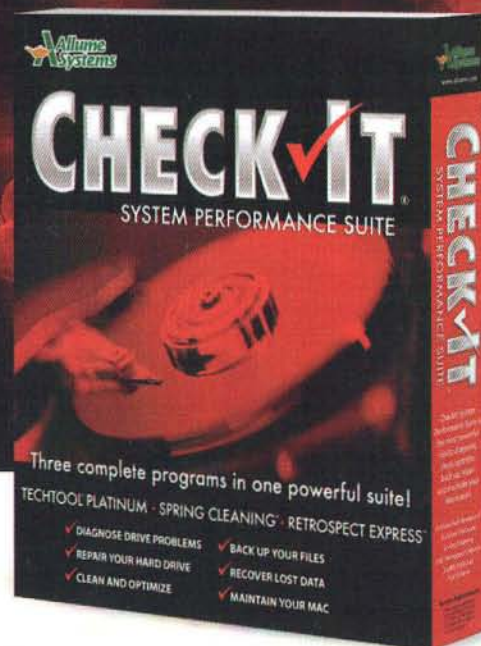
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APPLESCRIPT ESSENTIALS

by Benjamin S. Waldie

Introduction to Scripting Microsoft PowerPoint

In recent months, we have been discussing ways to automate the Office applications using AppleScript. We have discussed Word and Excel scripting, and this month, we are going to focus on scripting PowerPoint.

In Office X, PowerPoint's AppleScript dictionary contained a single command – `do Visual Basic`. While no direct AppleScript-ability was present, this command at least provided a way to initiate Visual Basic macrocode from AppleScript in order to automate some tasks. Of course, to do this, one needed to be fluent in Visual Basic.

With the release of Office 2004, Microsoft introduced reworked AppleScript support in the Office applications. Word and Excel both had their AppleScript dictionaries substantially rewritten and expanded, and PowerPoint introduced extensive AppleScript support. Sure, you can still use the `do Visual Basic` command to automate PowerPoint, if you wish. But, this isn't necessary anymore, as AppleScript code can now be written to perform repetitive tasks directly. Furthermore, Microsoft has announced that Visual Basic support will be removed from the Office applications when Office 2008 is released, thus rendering any `do Visual Basic` code useless moving forward.

In this month's column, we will explore the AppleScript support in PowerPoint 11, released with Office 2004. In future versions of PowerPoint, much of the terminology we will discuss is likely to remain functional, although it is always good practice to test code for terminology changes when performing any application upgrades in a scripted workflow. Let's get started.

Working with Presentations

Making a Presentation

In PowerPoint, the base class in which you will work is a `presentation`. To create a new presentation, use the `make` command, followed by the `presentation` class, as demonstrated here.

```
tell application "Microsoft PowerPoint"
    make new presentation
end tell
-> presentation "Presentation1" of application "Microsoft PowerPoint"
```

The result of the `make` command is a reference to the newly created presentation. This may be placed into a variable, if desired, for future reference throughout your code.

Referencing the Front most Presentation

It's important to understand how to reference the front most presentation in PowerPoint. Like documents in most applications, presentations can be referenced by index. However, unlike many other applications, a PowerPoint presentation's index does not refer to its front to back ordering. Rather, it refers to the order in which the presentation was opened or created, in reference to the other currently opened presentations. So, it is never safe to assume that `presentation 1` is the front most presentation. To ensure reference to the front most presentation, refer to the `active presentation` property of the application class instead, as demonstrated by the example code below.

```
tell application "Microsoft PowerPoint"
    active presentation
end tell
-> active presentation of application "Microsoft PowerPoint"
```

Note that the code above results in an ambiguous reference to the active presentation of the application, and not a specific presentation. If another presentation is brought to the front, then this reference will begin pointing to that presentation. Keep this in mind if you ever find that your code is not targeting the anticipated presentation, and verify the presentation ordering.

Opening a Presentation

To open a presentation file on disk, use the `open` command. For example:

```
set thePath to choose file with prompt "Please select a presentation:"
tell application "Microsoft PowerPoint"
    open thePath
end tell
```

When using the `open` command, please note that a result is not returned. Therefore, if your code will begin processing the newly opened presentation, you will need to form a reference to that presentation. While you could reference the `active presentation` property of the application, this is not always the safest method. To ensure an accurate reference to the newly opened presentation, locate the presentation whose file path is equal to the path from which the presentation was just opened. A presentation's path can be found by referencing its full name property. The following code demonstrates how to open



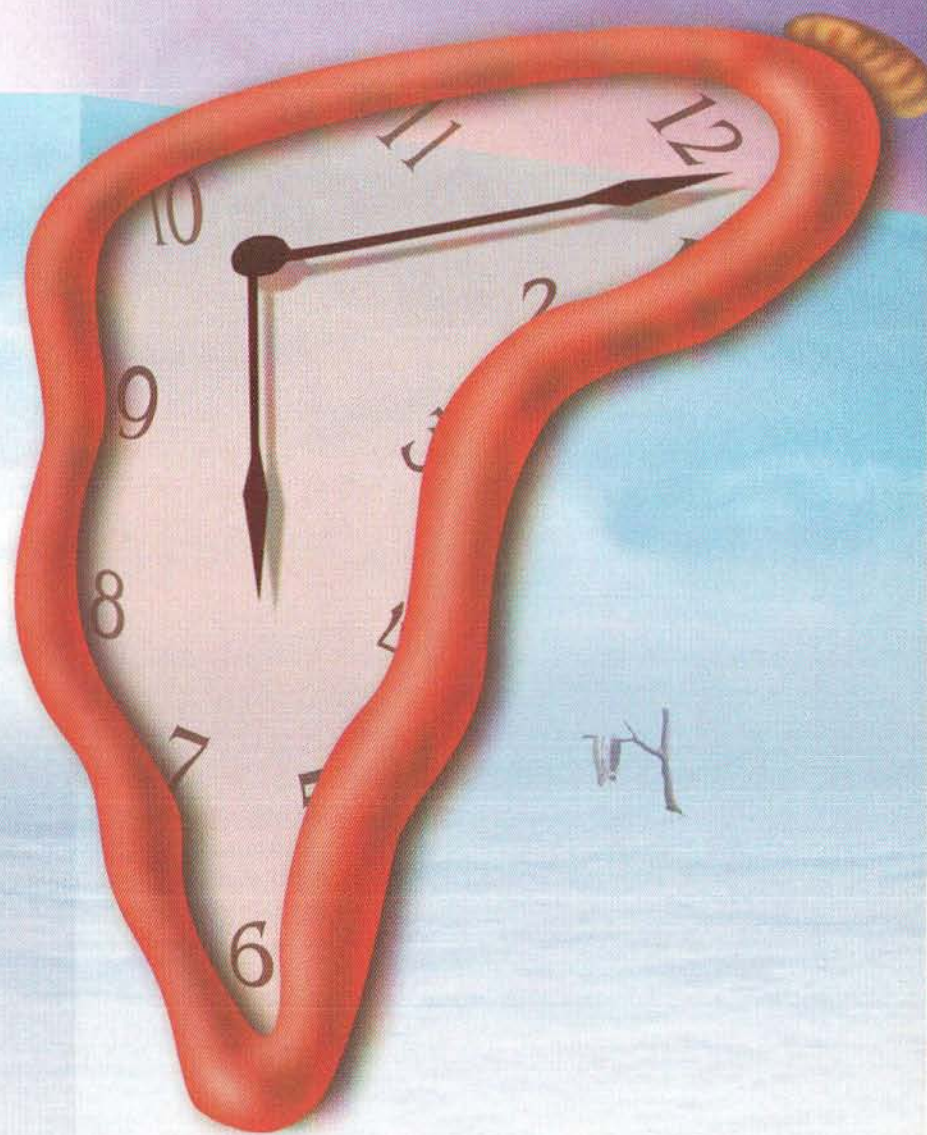
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a presentation, and then build a reference to the opened presentation by matching the opened path to the presentation's full name property.

```
set thePath to choose file with prompt "Please select a presentation:"
tell application "Microsoft PowerPoint"
    open thePath
    set theOpenedPresentation to first presentation whose full name = (thePath as string)
end tell
-> presentation 1 of application "Microsoft PowerPoint"
```

Saving a Presentation

To save a presentation that has been saved previously, use the `save` command, as follows:

```
tell application "Microsoft PowerPoint"
    save active presentation
end tell
```

This will cause the presentation to be saved in its original format back to its original path. You can also save a presentation into a new path, or in a different format. To do this, make use of the `save` command's optional parameters `in` and `as`. The following code demonstrates how to save a presentation to the desktop in presentation format.

```
set theOutputPath to (path to desktop folder as string) & "My Preso.ppt"
tell application "Microsoft PowerPoint"
    save active presentation in theOutputPath as save as presentation
end tell
```

Other supported save formats include presentation template, HTML, and PowerPoint show. You are encouraged to explore saving presentations in other formats further on your own.

Closing a Presentation

To close a presentation, simply use the `close` command, followed by a reference to the presentation you wish to close.

```
tell application "Microsoft PowerPoint"
    close active presentation
end tell
```

Although the `close` command has an optional saving parameter, which is supposed to allow you to specify a yes/no/ask constant value indicating whether the presentation should be saved when closed, PowerPoint seems to ignore it. To ensure that a presentation is saved before being closed, be sure to use the `save` command to save the presentation, and then issue the `close` command. For example:

```
set theOutputPath to (path to desktop folder as string) & "My Preso.ppt"
tell application "Microsoft PowerPoint"
    tell active presentation
        save in theOutputPath
    close
end tell
end tell
```

Working with Slides

In PowerPoint, content is contained within the slides of a presentation, and much of the AppleScript code you will be writing will involve the manipulation of slide content. First, we'll discuss creating slides, and then we will explore ways of manipulating slide content.

Making a New Slide

To create a new slide within a presentation, use the `make` command. In doing so, you may also wish to specify properties for the newly created slide, such as a layout style. This can be done by using the `make` command's `properties` parameter. The following example code demonstrates how to create a new text slide in the front most presentation. As you will see, the result of the `make` command will be a reference to the newly created slide.

```
tell application "Microsoft PowerPoint"
    tell active presentation
        make new slide at end with properties {layout:slide layout text slide}
    end tell
end tell
-> slide 2 of active presentation of application "Microsoft PowerPoint"
```

Manipulating Slide Text

There are numerous ways of manipulating text content within slides. You can change the text itself, and you can also change attributes of the text, such as font, style, color, and so forth. We'll discuss a few different ways to manipulate slide text. You are encouraged to explore these and others further on your own.

The first thing to understand when working with text content on slides is that the text is not directly contained within the slide itself. Rather, it is contained within shapes that reside on the slide. PowerPoint's shape class possesses a `text frame` property, which itself is a class possessing numerous properties. One property of the `text frame` class is `text range`, which references yet another class, called `text range`. `Text range` has numerous properties, one of which is `content`. To change the text content of a shape on a slide, this is the property you will want to modify. It sounds a bit complicated, but it's really not, as demonstrated by the code below. This code will set the content of the first text shape on slide 2 of our presentation to the text "TEST HEADING".

```
tell application "Microsoft PowerPoint"
    tell slide 2 of active presentation
        set content of text range of text frame of shape 1 to "TEST HEADING"
    end tell
end tell
```

Font and style attributes are applied via the `font` property of a `text range`, which, again, references a class itself. Attributes such as bold, underline, italic, and more, are all applied using the `font` class. The following example code demonstrates how



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to adjust font attributes in this manner. This code will first set the content of the second shape on slide 2 of our presentation to the text "Test Content". It will then change the font, point size, and color of the text. See figure 1 for an example of the result of this code.

```
tell application "Microsoft PowerPoint"
  tell slide 2 of active presentation
    set content of text range of text frame of shape 2 to
    "Test Content"
    tell font of text range of text frame of shape 2
      set font name to "Futura"
      set font size to 24
      set font color to {255, 0, 0}
    end tell
  end tell
end tell
```

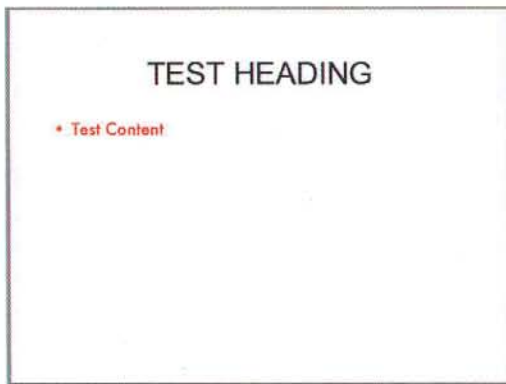


Figure 1. Styled Slide Text

Adding a Picture to a Slide

Adding a picture to a slide becomes slightly more complicated. To do this, you must first create a picture class on the target slide, while setting certain attributes for the picture, including its path, top, and left position. The following example code demonstrates how this is done. This code will first prompt the user to locate a picture file. It will then create a picture class at the specified top and left position on the target slide. The picture will then be scaled, relative to its original image size. An example of a slide containing an image placed using this code can be found in figure 2.

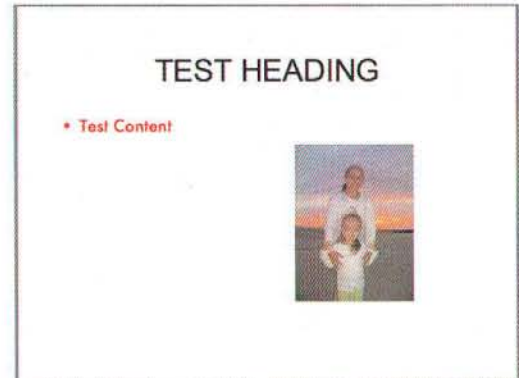


Figure 2. Placed Picture Content

```
set thePicturePath to (choose file with prompt "Please select
a picture:") as string
tell application "Microsoft PowerPoint"
  tell slide 2 of active presentation
    set thePicture to make new picture at end with
    properties {top:200, left position:400, lock aspect
    ratio:true, file name:thePicturePath}
    tell thePicture
      scale height factor 0.1 scale scale from top left
      with relative to original size
      scale width factor 0.1 scale scale from top left
      with relative to original size
    end tell
  end tell
end tell
```

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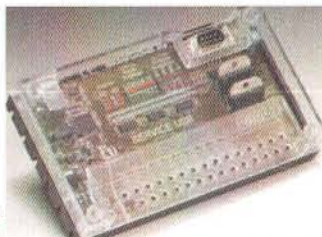
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Applying a Background to a Slide

Using AppleScript, it is possible to change the background of a slide. First, to ensure that background of the master slide is not modified, you'll probably want to disassociate the target slide's background from the master. Setting the slide's follow master background property to false does this.

To change the color of a slide's background, adjust the fore color property of the slide background's fill format to the desired RGB value. The following example code demonstrates how this is done. This code will also first disassociate the slide's background from the master.

```
tell application "Microsoft PowerPoint"
  tell slide 2 of active presentation
    set follow master background to false
    set fore color of fill format of background to {0, 0, 255}
  end tell
end tell
```


Other background attributes are also modifiable via AppleScript, including pattern, texture, and more. The code below shows how to apply a blue tissue paper texture as the texture of a slide's background. Figure 3 shows an example of the result of this code.

```
tell application "Microsoft PowerPoint"
    tell slide 2 of active presentation
        set follow master background to false
        preset textured background texture texture blue
    tissue paper
    end tell
end tell
```

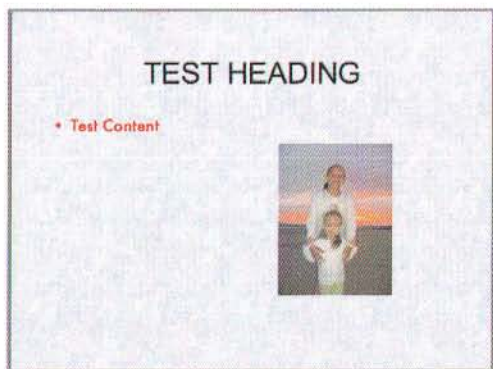


Figure 3. An Applied Slide Background Texture

Working with Slideshows

Applying Slide Transitions

Preparing presentations for slideshow mode is another task that AppleScript can perform quite easily. Slide show settings and transition settings are both accessible to AppleScript. The following code demonstrates how to loop through the slides of a presentation, applying a dissolve entry transition to each slide.

```
tell application "Microsoft PowerPoint"
    tell active presentation
        set theSlideCount to count slides
        repeat with a from 1 to theSlideCount
            set entry effect of slide show transition of
            slide a to entry effect dissolve
        end repeat
    end tell
end tell
```

Running a Slideshow

Once your slides are complete, you may want your script to run the slideshow. To do this, you will probably first want to bring PowerPoint to the front. Use the `activate` command to do this. Next, use the `run slide show` command, targeting the slide show settings of the presentation you want to run, as shown here.

```
tell application "Microsoft PowerPoint"
    activate
```

```
run slide show slide show settings of active presentation
end tell
```

Exiting a Slideshow

Exiting a slideshow is bit different than you might expect. You don't exit the presentation. Rather, you exit the slide show view of the slide show window of the presentation. For example:

```
tell application "Microsoft PowerPoint"
    exit slide show slide show view of slide show window of
    active presentation
end tell
```

In Closing

While we have truly only scratched the surface of what's possible by AppleScripting PowerPoint, the techniques discussed in this month's column should give you a good starting point. For more information about scripting PowerPoint, be sure to browse PowerPoint's AppleScript dictionary. Also, don't miss the PowerPoint AppleScript Reference Guide, available for free download from Microsoft's Mactopia website at <http://www.microsoft.com/mac/resources/resources.aspx?pid=asforoffice>.

Until next time, keep scripting!



About The Author



Ben Waldie is the author of the best selling books "AppleScripting the Finder" and the "Mac OS X Technology Guide to Automator", available from <<http://www.spiderworks.com>>, as well as an AppleScript Training CD, available from <<http://www.vtc.com>>. Ben is also president of Automated Workflows, LLC, a company specializing in AppleScript and workflow automation consulting. For years, Ben has developed professional AppleScript-based solutions for businesses including Adobe, Apple, NASA, PC World, and TV Guide. For more information about Ben, please visit <<http://www.automatedworkflows.com>>, or email Ben at <ben@automatedworkflows.com>.

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OS X Failover – Part 1

A Beginner's Guide

By Ben Greisler

Introduction

OS X Server has the capability to provide IP failover, a high availability feature that allows a secondary backup server to take over for a failed primary server. It is a great feature and can be very handy keeping your services available, but it has its limitations and constraints. We will review the basics of IP failover in this article and then expand on the concept in later issues. This is aimed at getting the beginner up and running with a minimum of hassle.

IP Failover Concepts

There are two major parts to the failover process: The primary server sending out notification that it is up and running and the secondary server monitoring the signal from the primary server. Kind of like, "Can you hear me now?" but without the primary server repeating "Good" after each question. This process is done via two daemons, `heartbeatd` and `failoverd`. Both are available on OS X Server, but not on OS X client.

On the primary server, `heartbeatd` sends out a message every second via port 1694 on both of the network interfaces involved in the process. This is the signal to the other machine in the failover pair that the primary is still alive and well, or at least well enough to keep a heartbeat going.

On the secondary server, `failoverd` listens for the heartbeat message on port 1694 on both network interfaces. If it stops receiving the heartbeat message it will start the failover process.

Initial configuration of IP failover starts in `/etc/hostconfig` where you define what role each server will be. We'll get into the specifics in the next section. There is a startup item at `/System/Library/StartupItems/IPFailover` that checks for configuration specifications and starts either `heartbeatd` or `failoverd` located in `/usr/sbin` as appropriate.

When `failoverd` on the secondary server realizes that it isn't receiving a heartbeat message, it sets off a series of events based on scripts located in `/usr/libexec`. The script `NotifyFailover` grabs the email address of failover recipient from `/etc/hostconfig` and sends a message to that address. It then utilizes the `ProcessFailover` script which will make an IP alias on a network interface, allowing the secondary server to take the IP address of

the primary server. Both of these scripts are available for examination and are pretty well commented.

Another purpose of the `ProcessFailover` script is to execute scripts located in the `/Library/IPFailover/<IP_Address>` folder. This folder does not exist in a standard install of OS X Server and has to be created if needed. Within that folder can be 4 subfolders: `PreAcq`, `PostAcq`, `PreRel` and `PostRel`. You can utilize these folders to perform certain actions. The names are self-explanatory and define when the content scripts will be used (i.e.: before IP acquisition or after the IP release, etc). This is where the power and flexibility of IP failover resides.

More information can be found in the High Availability Administration document http://images.apple.com/server/pdfs/High_Availability_Admin_v10.4.pdf, but it does have some incorrect information as referenced in this Apple tech article: <http://docs.info.apple.com/article.html?artnum=305066>

Setting up IP Failover

In this article, we will set up the most basic IP failover configuration to show that it works. In general, IP failover can be done in three easy steps:

1. Set up OSX Server on two machines with appropriate network configurations.
2. Add the appropriate entries to `/etc/hostconfig` on both machines.
3. Reboot each machine and have a working IP failover pair.

Easy, huh? Ok, now to the steps needed to accommodate the above.

It is best that the two machines in the failover pair be as identical as possible. You wouldn't want the machines to be on different OS versions, or have a secondary server that can't handle the load that the primary server normally handles. It is also tempting to give the secondary server other work to do while it is just sitting there listening to the heartbeat of the

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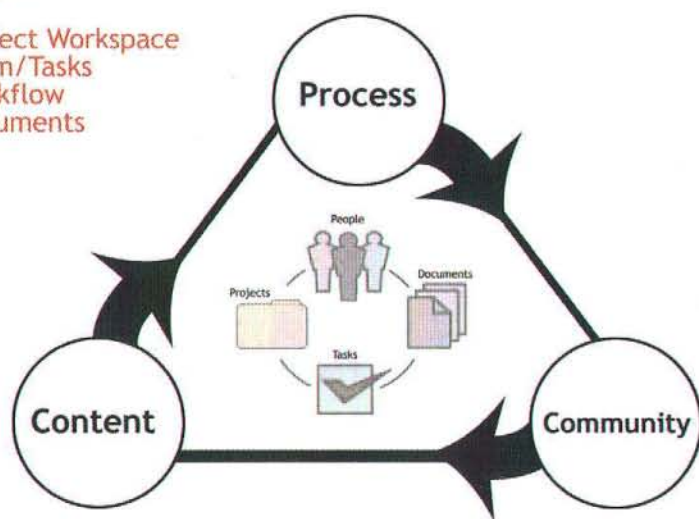
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primary server, but refrain from that. Its job is to be a backup server, pure and simple.

We need to set up two networks for the IP failover pair to join. One will probably be your existing network that your other machines use to connect to your server. The other network will be a private network that the pair will communicate over. Typically this will be IP over Firewire. You don't have to do it this way, but it does preserve your secondary Ethernet port on machines that have one and allows a private network on machines that don't have a second Ethernet port (i.e.: MacMini).

Lets setup our networking like this:

Primary Server

192.168.254.165 on en0
255.255.255.0 Subnet Mask
192.168.254.1 Gateway

10.0.0.165 on fw0
255.255.0.0 Subnet Mask

Secondary Server

192.168.254.170 on en0
255.255.255.0 Subnet Mask
192.168.254.1 Gateway

10.0.0.170 on fw0
255.255.0.0 Subnet Mask

Make sure that you have good DNS entries for both machines and test them. Do not enter DNS servers or gateway information in the Firewire interface.

Now, let's edit /etc/hostconfig on each server (using your favorite editor via sudo). Add the following lines:

Primary Server

FAILOVER_BCAST_IPS="192.168.254.170 10.0.0.170"
FAILOVER_EMAIL_RECIPIENT=user@domain.com

Secondary Server

FAILOVER_PEER_IP_PAIRS="en0:192.168.254.165"
FAILOVER_PEER_IP="10.0.0.165"
FAILOVER_EMAIL_RECIPIENT=user@domain.com

So, what does all that mean?

FAILOVER_BCAST_IPS="192.168.254.170 10.0.0.170"-This identifies to the primary server the IP addresses of the network interfaces of the secondary server. You can either specify the IP's of the secondary server or use the broadcast addresses for the subnet (i.e.: 192.168.254.255, 10.0.0.255)

FAILOVER_PEER_IP_PAIRS="en0:192.168.254.165"-This identifies the primary interface IP of the primary server. Note the syntax of "en0:" when creating your configuration.

FAILOVER_PEER_IP="10.0.0.165"-This identifies the secondary interface on the primary server. In this case it is the Firewire port (fw0).



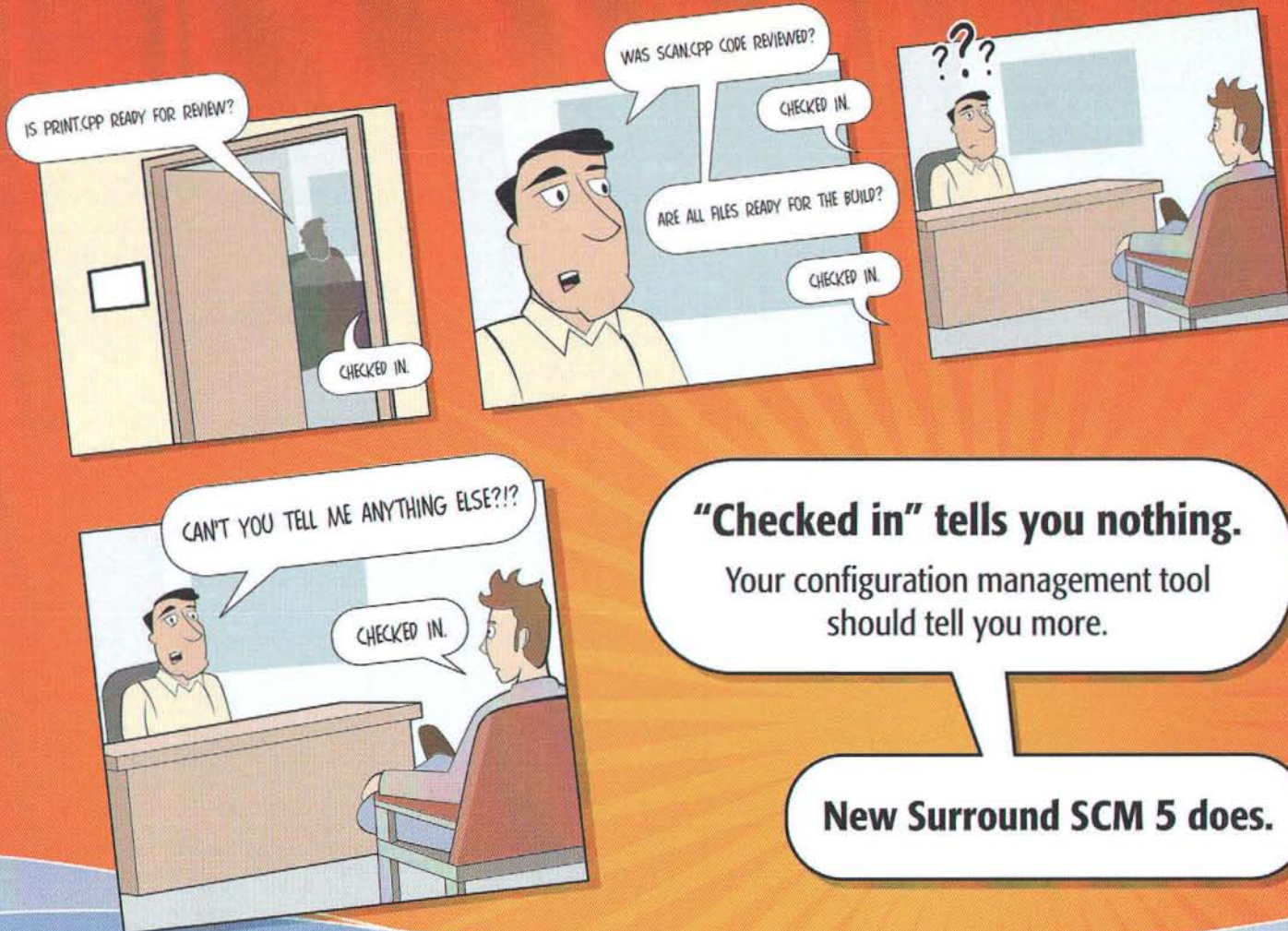
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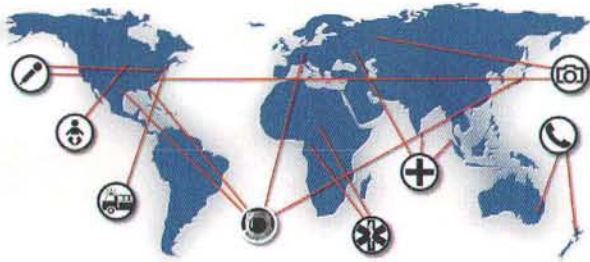


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`FAILOVER_EMAIL_RECIPIENT=user@domain.com`-This is the email address of the person who needs to know about failover actions. Make sure that your machine is configured to be able to send mail. You may need to configure SMTP services.

Hook up the servers to the Ethernet network and connect a Firewire cable between the two machines. Check that you can ping each machine on each interface from each machine. Both machines need to be able to see one another. Now restart the primary machine and then the secondary. This is important because if you start the secondary machine before the primary, it won't hear the heartbeat message from the primary and will try to failover immediately.

Ok, now that each server is up and running let's test it out. On a third machine, ping the primary server's public IP address. You should get a good solid return. Now open up Console on each machine and view the System log. Using `tail` on `/var/log/system.log` so you can see what is going on with each machine, alternately pull the Firewire cable and then Ethernet cable on the primary machine. You will notice that you stop getting ping responses from the primary server. Wait a few seconds and you should see the pings start to return again. This is the secondary machine reacting to the loss of the heartbeat message from the primary machine and initiating the `ProcessFailover` script to allow the secondary machine to acquire the IP of the primary machine. You have just gotten IP failover to work!

To fallback, I suggest not just plugging the cables back into the primary machine. In a production environment you may have to shutdown the secondary server in a controlled manner, bring the primary back on line and then bring up the secondary. This is inconvenient as it would be great if you could just have everything fallback to its original state, but practice has shown that this doesn't happen exactly the way you would want it to in every case.

Conclusion

So, it's great that we can failover from one server to another, but what good does this really do us? In the next article we will start making IP failover do some tricks for us that will be useful. Stay tuned!

References:

http://images.apple.com/server/pdfs/High_Availability_Admin_v10.4.pdf
<http://docs.info.apple.com/article.html?artnum=305066>
man heartbeat
man failoverd

MI

About The Author

Ben has worked Apple based technology integration projects from Maine to Japan while learning all the way. When not collecting frequent flyer miles he spends his favorite time with his wife and 2.5 year old daughter at their home outside of Philadelphia. He can be reached at magikben@mac.com



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Apple's transition from Apple Partition Map to the GUID Partition Table

By Criss Myers

Preface

In January 2006, Apple moved from PowerPC processors to Intel processors. This brought with it a number of changes to the way that a Macintosh works. These changes involved the move from the IBM manufactured PowerPC RISC chip to the Intel Core Duo CISC chip, which meant a move for Apple to an X86 architecture. At the same time, Apple chose to make a few other changes. One was the move from Open Firmware, the open source version of Sun Microsystems boot firmware, to Intel's Extensible Firmware Interface (EFI), previously used on Intel's Itanium hardware. Another major change involved a change to the partitioning structure of the disk. Apple moved from its long standing Apple Partition Map (APM) to the Intel-created GUID Partition table (GPT) which is part of the EFI specification. This article will examine these changes to the partitioning structure and assess the impact that this will have on Apple.

APM vs GPT

Apple Partiton Map (APM)

Apple's Partiton Map was created in 1987 by Apple for the Macintosh II and has remained relatively unchanged since then. APM is a very robust and simple partition structure for partitioning a drive which can then be formatted as either HFS or HFS+ filesystem. Unlike DOS partitions, APM does not contain any boot code; the computer's Open Firmware has the code to read this structure. The APM is read by Open Firmware, then the HFS+ file system is read and finally, the Operating System is booted. Open Firmware can only boot Operating Systems from HFS filesystems. Also unlike DOS partitioning, APM can describe as many partitions as required, whereas DOS is limited to 4 primary partitions. This type of partition structure is used on desktop Macs and portables as well as iPods and apples disk images, it is also used on dual formatted CD's.

APM Structure

Hard disks are divided into blocks, or sectors, and each block typically consists of 512 bytes. On a Mac, hard disk block 0 is the driver descriptor block and contains the driver description record.

Block 1, actually the second block, contains the Apple Partition Map. Unlike other partition structures, it is defined as a partition in its own right. The APM describes the partition sturcture of the drive and contains partition entries for each partition including one for itself. These partition entries can be in any particular order and do not need to correspond to the physical organisation of the partitions. The number of partition entries is not restricted, but the map cannot be enlarged later. Once the drive has been partitioned and the APM created, the remaining space on the drive belongs to the rest of the partitions, and there is therefore no free space to enlarge the APM at a later time. All space on the drive must belong to a partition, as APM does not support free space. The APM is read by Open Firmware and all partition entries are read in order.

Partition Map Entries

The APM is layed out in 512 byte data structures, each 512 data structure is a map entry and defines each partition, these entries are laid out in consecutive sectors. Each entry describes how many partitons exist, the starting sector of the partition, its size and type, as well as volume name, the location of the data area and location of any boot code. Since each 512byte data structure lists the number of total partitions on the disk, from this the Open Firmware knows how many sectors to read in order for it to read the whole partition map.

Figure 1 shows the typical layout of an APM, the Partition Map being the first entry and also a partition, the second entry is partition 1, etc.

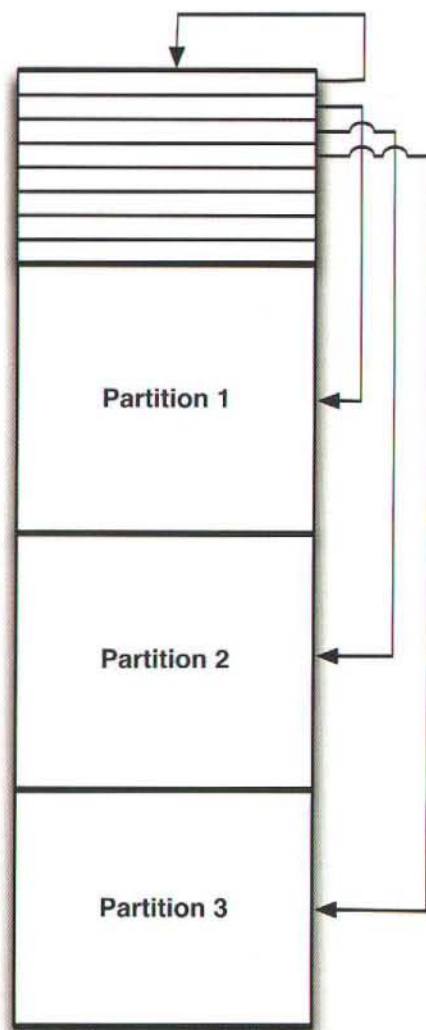


Fig 1. Typical Partition Map

Figure 2 shows the entry details for a single 512byte Partition Map Entry

Byte Range	Description	Essential
0-1	Signature value (0x504D)	No
2-3	Reserved	No
4-7	Total Number of partitions	Yes
8-11	Starting sector of partition	Yes
12-15	Size of partition in sectors	Yes
16-47	Name of partition in ASCII	No
48-79	Type of partition in ASCII	No
80-83	Starting sector of data area in partition	No
84-87	Size of data area in sectors	No
88-91	Status of partition (see Fig 3)	No
92-95	Starting sector of boot code	No
96-99	Size of boot code in sectors	No
100-103	Address of boot loader code	No
104-107	Reserved	No
108-111	Boot code entry point	No
112-115	Reserved	No
116-119	Boot code checksum	No
120-135	Processor type	No
136-511	Reserved	No

Fig 2. Partition Map Entry

Type	Description
0x00000001	Entry is valid (A/UX only)
0x00000002	Entry is allocated (A/UX only)
0x00000004	Entry in use (A/UX only)
0x00000008	Entry contains boot information (A/UX only)
0x00000010	Partition is readable (A/UX only)
0x00000020	Partition is writable (Macintosh & A/UX)
0x00000040	Boot code is position independent (A/UX only)
0x00000100	Partition contains chain-compatible driver (Macintosh only)
0x00000200	Partition contains a real driver (Macintosh only)
0x00000400	Partition contains a chain driver (Macintosh only)
0x40000000	Automatically mount at startup (Macintosh only)
0x80000000	The startup partition (Macintosh only)

Fig 3. Status value for Apple partitions.

GPT

EFI, Extensible Firmware Interface, was created by Intel in an effort to introduce a modern firmware for generic PC hardware. GPT is the partitioning scheme included in this firmware. The traditional Master Boot Record used by most legacy PC BIOS systems has severe limitations and is outdated. Interestingly, due to the way the PC BIOS "grew up", it also has no official specifications. GPT was first used on Intel's Itanium hardware along with EFI.

GPT is defined by a formal standard as part of EFI. EFI is defined by Intel's "Extensible Firmware Interface Specification", version 1.1, or by UEFI, "Unified Extensible Firmware Interface Specification", version 2.0, to which many companies belong, called the Unified EFI Forum. Apple is a member of this group.

It is very similar to Apple's APM scheme in that it also uses Logical Block Addressing (LBA) with each block being 512bytes. GPT is a partition scheme which defines the partitioning but unlike APM (which is defined as a partition itself in block 1) GPT encompasses the whole drive with a secondary partition table at the end of the drive. This acts as a backup for the primary data.

Like APM, GPT starts at block 1, but unlike APM which uses block 0 as the drive descriptor block, GPT uses block 0 as a Protective MBR (Master Boot Record). The purpose of the Protective MBR is protect the GPT drive from legacy PC BIOS Systems. EFI systems will read the GPT scheme on the drive, however, legacy MBR disk formatting tools cannot read GPT and would therefore potentially write over it. The Protective MBR can be read by these disk utilities and indicates a single partition encompassing all of the GPT partitions on the drive. A system ID for this partition is set to 0xEE which indicates a GPT drive, EFI then reads this ID and thus ignores the protective MBR, however, 32bit Operating Systems will still read this and see it as a single inaccessible disk.

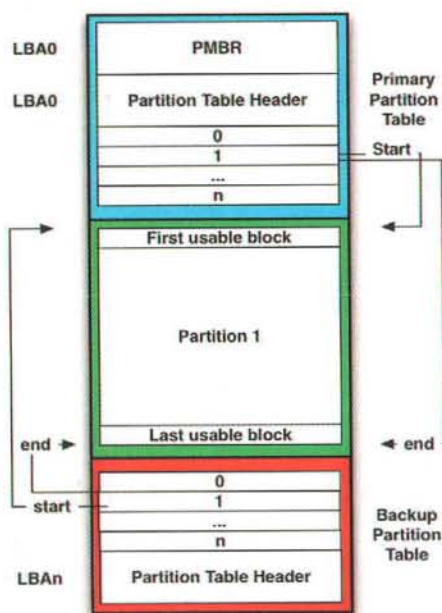


Fig 4. Typical GPT Partition layout

The Fig 4 shows the Protective Master Boot Record (PMBR) in Logical Block Address 0 (LBA0), the Primary and Backup Partition Table at the beginning and end of the disk, consisting of the Table header and the table entries in purple.

Block 1 contains the Primary GPT Partition table header, this defines the usable blocks on the disk as well as the number and size of the partition entries that make up the table. The header contains the disk GUID. It records its own size and location (always block1) and the secondary header, the last sector on the disk which can be used to recover a corrupt header. It also contains a CRC32 checksum for itself and the partition table (blocks 2-33). This checksum is read and verified by EFI and if found to be corrupt EFI will use the secondary header and write this header over the primary one. If both are corrupt then the drive is unreadable.

Figure 5 shows the entry details for a 512byte GPT Partition Table Header.

Byte Range	Description	Mnemonic
0-7	Identifies EFI-compatible partition table header. This value must contain the string "EFI PART,"0x5452415020494645.	Signature
8-11	The revision number for this header. This revision number is not related to the UEFI Specification version. This header is version 1.0, so the correct value is 0x00010000.	Revision
12-15	Size in bytes of the GUID Partition Table Header. The HeaderSize must be greater than 92 and must be less than or equal to the logical block size.	HeaderSize
16-19	CRC32 checksum for the GUID Partition Table Header structure. This value is computed by setting this field to 0, and computing the 32-bit CRC for HeaderSize bytes.	HeaderCRC32
20-23	Must be zero	Reserved
24-31	The LBA that contains this data structure	MyLBA
32-39	LBA address of the alternative GUID Partition Table Header	AlternativeLBA
40-47	The first usable logical block that may be used by a partition described by a GUID Partition Entry	FirstUsableLBA
48-55	The last usable logical block that may be used by a partition described by a GUID Partition Entry	LastUsableLBA
56-71	GUID that can be used to uniquely identify the disk	DiskGUID
72-79	The starting LBA of the GUID Partition Entry array	PartitionEntryLBA
80-83	The number of partition entries in the GUID Partition Entry Array	NumberOfPartitionEntries
84-87	The size in bytes of each of the GUID Partition Entry structures in the GUID Partition Entry array. Must be a multiple of 8	SizeOfPartitionEntry
88-91	The CRC32 of the GUID Partition Entry array. Starts at PartitionEntryLBA and is computed over a byte length of NumberOfPartitionEntries x SizeOfPartitionEntry	PartitionEntryArrayCRC32
92-512	The rest of the block is reserved by UEFI and must be zero	Reserved

Fig 5. GUID Partition Table Header


Blocks 2-33 are the primary GPT entry array, these 32 sectors are reserved for GPT partitions. This equals 16,384 bytes and therefore a possible 128 partition entries of 128bytes. This GPT Entry Array is then mirrored by the secondary GPT Entry Array at the end of the disk, before the secondary partition header, which it uses to recover a damaged primary entry array. Since these blocks are reserved, this means that, unlike APM, the partition table can be altered at any time to create new partitions up to 128. An empty entry array is defined as 0, indicating that it is not in use. These arrays are continuous.

Each entry is simple and contains 128bytes, the first 16bytes designate the partition type with a partition GUID. The second 16bytes contains a GUID unique to the partition so that the partition can be identified. The rest of the bytes contain the partition names and attributes as well as the start and end blocks. These entries do not need to be sorted and just like the APM, they do not have to be in the same order as the partitions.

The remaining blocks on the disk are then the usable blocks for the partitions, but unlike APM, GPT does not require that all blocks must belong to a partition, therefore unpartitioned blocks are free space.

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— Mike Kneebone, North Central High School, Indianapolis"

Figure 6 shows a typical Partition Entry for a single partition.

Byte Range	Description	Mnemonic
0-15	Unique ID that defines the purpose and type of this partition. A value of zero defines that this partition entry is not being used.	PartitionTypeGUID
16-31	GUID that is unique for every partition entry. Every partition ever created will have a unique GUID. This GUID must be assigned when the GUID Partition Entry is created. The GUID Partition Entry is created whenever the NumberOfPartitionEntries in the GUID Partition Table Header is increased to include a larger range of addresses.	UniquePartitionGUID
32-39	Starting LBA of the partition defined by this entry	StartingLBA
40-47	Ending LBA of the partition defined by this entry	EndingLBA
48-55	Attribute bits, all bits reserved by UEFI	Attributes
56-127	Unicode string.	Partition Name
128	The rest of the GUID partition entry is reserved by UEFI and must be zero.	Reserved

Fig 6. GPT Partition Entry

Conclusions to Draw

As we can see, APM is restricted to 32 bits worth of blocks which will limit the total disk size to 2 terabytes. At the moment this is not really much of a problem but with disk sizes getting larger all the time this is a potential future limitation. Apple was given a choice: they could extend APM to support larger disk sizes, which would break all existing partitioning tools, or move to a completely different partition scheme. When Apple decided to move to an Intel based platform and switch from Open Firmware to an EFI, it gave them the perfect opportunity to use the GPT partition scheme. As we can see, this partition scheme is not unlike APM but offers more flexibility *and* backup recovery. However it does

mean that there are compatibility issues. An open firmware machine cannot boot from a GPT disk. Any Apple machine, be it PowerPC or Intel, running 10.4 and above can mount both a GPT disk and an APM disk. Any machine running 10.4.6 and above can also format GPT disks.

The GPT standard is very flexible and does not define exactly how to partition a disk. It merely describes the realm of what is possible. This means Apple can implement their own support for GPT, as can third party companies.

Apple's implementation of GPT

Apple has defined a set of Apple-specific partition types which are entered in bytes 0-15 of the Partition Entry. Figure 7 describes these types.

Type	GUID	APM Equivalent
HFS Plus	48465300-0000-11AA-AA11-00306543ECAC	Apple_HFS
UFS	55465300-0000-11AA-AA11-00306543ECAC	Apple_UFS
Boot	426F6F74-0000-11AA-AA11-00306543ECAC	Apple_Boot
RAID	52414944-0000-11AA-AA11-00306543ECAC	Apple_RAID
Offline RAID	52414944-5F4F-11AA-AA11-00306543ECAC	Apple_RAID_Offline
Label	4C616265-6C00-11AA-AA11-00306543ECAC	Apple_Label

Fig 7 Apple Partition Types.

Apple also defines a partition policy for its disks and the way in which the partition map is laid out. Apple defines disks in 3 ways, tiny, small and big. Tiny being less than 1GB, small being between 1GB and 2GB and big being any disk larger than 2GB.



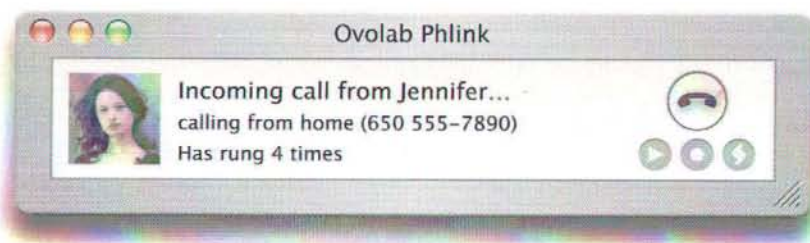
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Tiny disks are created with no reserved free space and no extra partitions; the partitions are laid out as the user specifies.

Small disks are created with no extra partitions but have 128mb of free space at the end of each partition.

Big disks always have a 200mb EFI system partition called ESP as the first partition on the disk and also have the 128mb of free space after each partition (not including the ESP partition)

Each disk is then aligned to a 4KB boundary to accommodate the limitations of the HFS plus file system implementation on Mac OS X.

Free space is left at the end of each partition to make it easier for future system software to manipulate the partition map in ways that Apple cannot anticipate at the moment.

ESP is a special partition from which EFI can load EFI boot-time device drivers. Apple's EFI supports ESP but does not use it at the moment but when you format a GPT disk this partition is created for future use.

We can see that Apple has done everything to support the compatibility of both APM and GPT and has considered future development when laying out the GPT partition on Apple disks. In general, there should be no issues with switching from APM to GPT: your new Intel Mac will be able to mount and write to any existing external drives you might have that are partitioned as APM, and as long as you have 10.4 on your PowerPC Mac you can mount and write to your GPT external drives. There should be no need to boot a GPT drive on a PowerPC.

There are, however, a few concerns when copying disks. These will mostly apply to software developers creating cloning and backup tools for GPT. In the GPT header is a GUID for the disk, and by its definition (globally unique ID) is a unique number. Apple system software relies on this to identify disks, and if a disk is cloned by a block-by-block tool, then both disks will have the exact same number. If the copy is to be a backup of the original and to be used to restore the original, then an identical GUID is required. However if the copy is to be used online as a duplicate, then the disk GUID will need to be changed so the system sees each drive as a different copy.

One last issue is with certain drive's firmware. Some drive firmware can be buggy and report errors when the very last block on a disk is accessed. For an APM disk this is not an issue as Apple's implementation of APM creates a small Apple_Free partition at the end of the disk for this reason. GPT requires the use of the last block for its backup partition table header and this cannot be avoided. Apple's implementation ignores any errors given when reading the backup header. If an error occurs the disk has a valid primary but an invalid backup, such a disk is still considered readable. This disk will not be able to recover if the primary gets damaged. If the error occurs when the partition scheme is being created then the partitioning will fail and the drive cannot be partitioned by Apple software.

If you wish to run other operating systems on an Intel Mac such as Linux or Windows there are not many options, RedHat is developing a GPT based OS and Windows Vista should support GPT. Apple's move to GPT will make multi booting a Mac much easier in the future once GPT compatible operating systems are written and as more and more PC hardware manufacturers adopt EFI and GPT.

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About The Author

Criss Myers is a Senior Mac IT Technician for the Faculty of Science and Technology, at the University of Central Lancashire, Preston, United Kingdom. He has been a Systems Server Administrator from the very first version of OS X Server. He Works with Macs as well as Linux, Unix and Windows.

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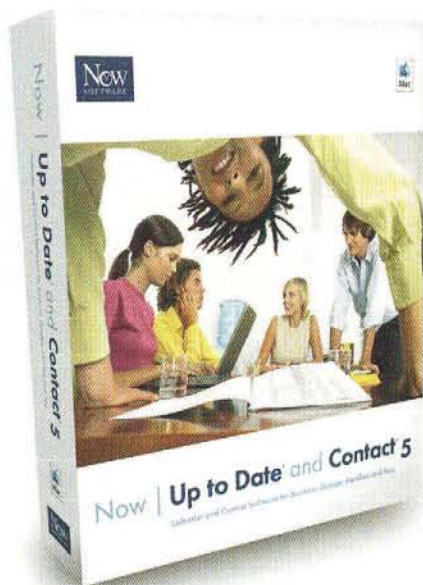
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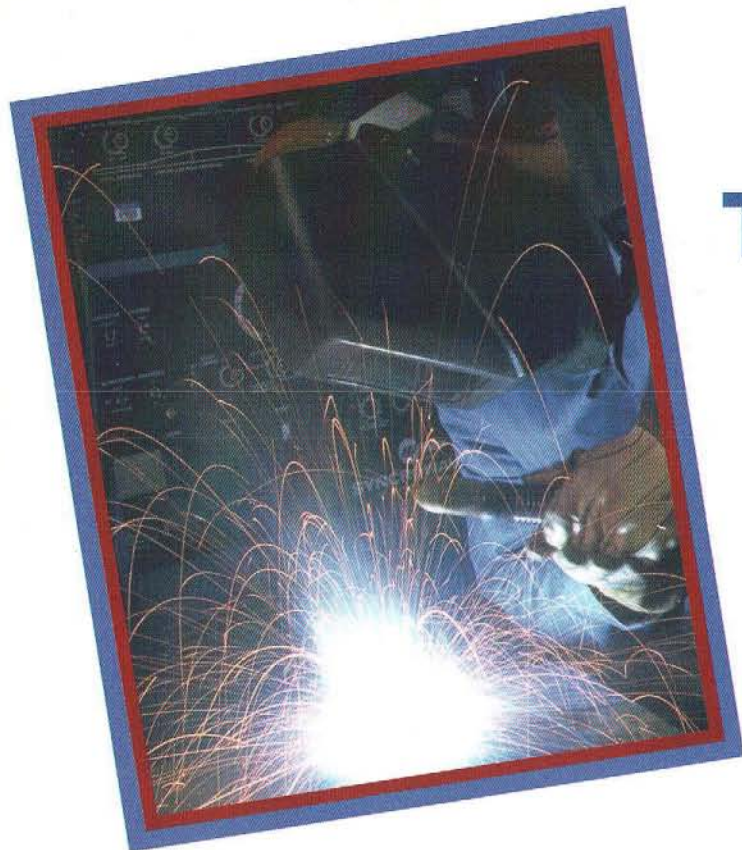
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THE SOURCE HOUND

MacFUSE: The Man Behind the Mask

Open Source Strikes Again

by Dean Shavit

Once in a while, an Operating System Event occurs which has the potential to drastically change the user experience for everyone who works on the platform. Sometimes these events are “ah-ha” events, such as the preview of Time Machine for Leopard at WWDC, where the normally complex and tiresome task of daily backups and recovery of lost files and folders blossomed into something both sensible and fun. The release of NeoOffice (<http://neooffice.org>), an aquafied port of the Open-Source OpenOffice suite in spring of 2005, also heralded a major event in the story of Mac OS X.

Some events take a while to unfold or find their niche or hang around for a while then pick up steam to suddenly become real assets. The Growl project (<http://www.growl.info>) turned the mundane and cumbersome “jumping icon” user notification for applications into an elegant, translucent, and customizable badge of information for those application developers that didn’t necessarily want to write our own notification systems or rely on Mac OS X’s clunky leaping icons. In a similar vein, the Sparkle project (<http://andymatuschak.org/pages/sparkle>) has rapidly assumed the vacant position of software update engine of choice for independent developers.

Many of these voids in functionality create vacancies that developers for Mac OS X can occupy or thrive in, given the right vision, implementation, or something as simple as good timing. Last year, when researching the “Mac Tech 25” most influential technical professionals, I said: “Someone has to wear the crown of top Mac OS X Hacker, and no one who has visited Amit Singh’s website—<http://www.kernelthread.com> (now superseded by www.osxbook.com) would argue otherwise.”

The “crown” in question here is not just euphemism bestowed lightly for the sake of good reading but a title earned. As if his 1600 page study “Mac OS X Internals: A Systems Approach” wasn’t enough of a contribution to the Mac OS X technical community, Amit surprised us – no, stunned us – yet again with his presentation “Taming Mac OS X File Systems” at MacWorld where he unveiled MacFUSE.

Between Amit’s initial presentation and the time this article is printed, MacFUSE has already been updated several times, and is now distributed on a disk image with a double-clickable installer. Super-geeky technology aside, MacFUSE, at least in terms of function, is best understood by watching Amit’s video presentation about the possibilities linked here: <http://code.google.com/p/macfuse>. Even though many of the filesystems he demonstrates are working (and unreleased) prototypes, it’s not hard to see why rssfs (the ability to browse, organize, and sort rss feed:// URLs as if they were files in a folder, and launch them by double-clicking) or iofs (which shows kernel events as a browseable file system) are just downright cool and useful.

Even so, currently working and fully supported FUSE filesystems for Mac OS X include sshfs (a read-write volume mounted on your desktop via ssh) ftpfs and ntfs-3g (allowing for read/write NTFS – such as a normally read-only Boot Camp partition). Initially, the prospect of mounting a file system using sshfs normally accessed through other means (such as the command-line) might leave some end users scratching their heads wondering why they would want to do that...but certainly not the developers who’ve spent a great many hundreds of man-hours building GUIs for scp, sftp, or ftp (just look at Cyberduck and Fugu). Now, developers get mountable and encrypted read/write filesystem capabilities with the installation of one free (and Open-Source) package.

An Interview with Amit Singh

I had many questions about the technology behind MacFUSE, and what prompted Amit Singh to bring it to Mac OS X. I decided

to ask him those questions directly. Amit's reputation is that he's "ridiculously brilliant" when it comes to computer operating systems and so naturally I had some trepidations about not being well prepared enough to engage in such a dialogue with him. I have to say, though, that my anxiety was entirely unfounded. Not only does Amit know how to code, he also knows how to *communicate*, something I'd learned from reading his articles on his site, <http://osxbook.com>. What I wasn't prepared for was his ability to explain things *at my level* in a perfectly understandable way and with a rare gentleness where others might be mocking or arrogant. What could have been painful for me was made a pleasure, and I learned that Amit's motivation in learning and improving Mac OS X may well stem from *his* desire as a Mac OS X user to *do his own work* more effectively.

Dean Shavit: As Open-Source editor for MacTech, I often try to write articles focused on what some would call "Force Multipliers" or "Enablers," in other words those Open-Source projects that add value or capabilities to Mac OS X with easily-understandable and accessible APIs. I think that MacFUSE is destined to become such an enabler.

Amit Singh: Thank you. I hope so too. So far, response to MacFUSE has been uniformly positive. People seem to find it both useful and "cool", and something that was sorely missing on Mac OS X.

Dean Shavit: Well, let's not waste any time then *grin* I think that Mac OS X is short on file system support, and that the learning curve to produce such support has (without a tool like MacFUSE) been prohibitive, perhaps even for Apple's own engineers! In the five years I've been using the platform, I've not noticed much progress in the way of file systems other than the enhancements to HFS+ (extended attributes and journaling) and read-only NTFS. I've seen an Open-Source kernel extension to support Linux ext2 (<http://sourceforge.net/projects/ext2fsx>), but that's really only to read external drives or drives pulled from Linux systems. So, how did you arrive at MacFUSE as a possible solution to this shortfall in filesystem support?

Amit Singh: Writing file systems (the traditional way) is super hard—essentially black magic, regardless of which operating system you are on. A few months ago (after WWDC 2006), I had been thinking of things that would be really nice to have on Mac OS X but were missing. Two things were near the top of my list: a FUSE-like mechanism and DTrace. Apple took care of the latter, so I thought I might give the former a shot.

Dean Shavit: Well I don't know if it was intentional on your part, but over the years, your interest in Mac OS X seemed to have focused both on the kernel and Mac OS X filesystems, with great utilities like HFSDebug and of course your book "Mac OS X Internals" So MacFUSE, which combines kernel expertise and filesystem expertise seems like a logical outgrowth of your

work over the years. Did you attend WWDC? I was pretty disappointed that you weren't speaking at the conference. I also noticed (when visiting the Apple Campus Store) that two shelves were dedicated to your book. The folks at the store said that they couldn't keep 'them in stock!

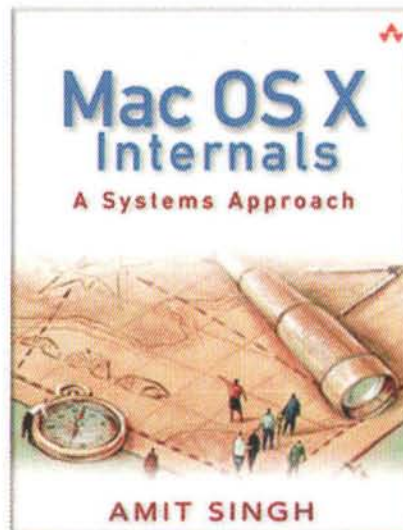


Figure 1. "Mac OS X Internals"

Amit Singh: I did attend WWDC 2006—the first Apple conference I ever attended. As for the book, I'm glad that it has been well received. There can be no bigger reward for a technical author than to see people find their book useful and/or interesting. My interest in Mac OS X ... that's just a manifestation of my interest in operating systems. I've been similarly interested in other systems, just not to this extent I suppose.

Dean Shavit: Well that interest certainly shows in your work, but especially in your writing. Was that part of the reason you moved to Google from IBM, so you could work with Mac OS X?

Amit Singh: Oh no, not at all. My move had nothing to do with Mac OS X, and I was in fact not on the Macintosh team for my first several months at Google. Conversely, I worked on some Macintosh stuff even at IBM. Like I said earlier, my deeper interest is in operating systems. Mac OS X just happens to be rather convenient because that's what I use, too.

Dean Shavit: Well we're certainly glad you're on the Google Macintosh team now! Have you ever participated in writing a file system (the traditional way?) for any Operating System?

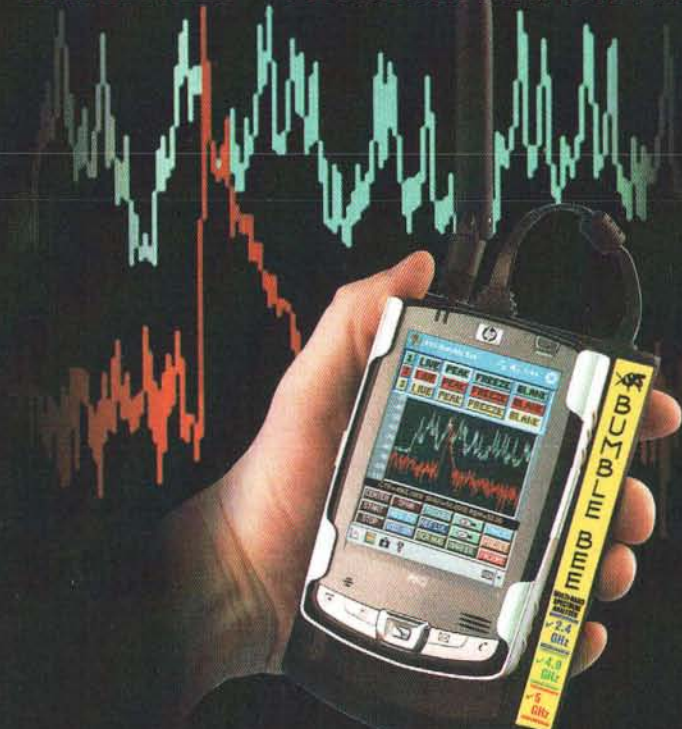
Amit Singh: I've written experimental file systems for Linux and Solaris.

Dean Shavit: Was MacFUSE your first attempt at a kernel extension?

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Amit Singh: You mean for Mac OS X?

Dean Shavit: Yes, but if you've written others, were they for Microkernels?

Amit Singh: No. "Mac OS X Internals" has some examples of kernel extensions. I've also released other kernel extensions for Mac OS X (like the TPM device driver and the /dev/kmem driver). [T]his one isn't for a microkernel either — you aren't implying Mac OS X uses a microkernel, are you?

My personal experience with sshfs has been quite good—I do use it for playing QuickTime video [on a LAN].

Dean Shavit: I thought it did, and it seems to be an accepted notion, but if I'm wrong, tell me why...

Amit Singh: Well, let me ask you — why do you think it uses a microkernel? Is it because of the Mach connection?

Dean Shavit: It's just the way I read the Mac API reference docs. To quote "Mac OS X is based on the Mach 3.0 microkernel, designed by Carnegie Mellon University, and later adapted to the Power Macintosh by Apple and the Open Software Foundation Research Institute (now part of Silicomp). This was known as osfmk, and was part of MkLinux (<http://www.mklinux.org>). Later, this and code from OSF's commercial development efforts were incorporated into Darwin's kernel."

Amit Singh: Let me quote something from page 50 of "Mac OS X Internals"...

"Mach is often unequivocally equated to a microkernel, but as we saw in Chapter 1, it was not until version 3 of Mach that it was used as a true microkernel. ... Even though Apple uses a Mach implementation that derives from Mach 3, xnu does not use Mach as a microkernel. Various subsystems that would be implemented as user-space servers in a true microkernel system are part of the kernel proper in Mac OS X. In particular, the BSD portion of xnu, the I/O Kit, and Mach, all reside in the same address space."

Apple's kernel only uses code that comes from Mach—it is not a microkernel at all.

So your question becomes: "Why doesn't Apple use a microkernel?"

Dean Shavit: OK....

Amit Singh: Well, short answer: they just don't! In a commercial operating system, adopting a kernel is a long-term deal ... you can't just go on changing your kernel architecture across releases ... Apple went with the NEXTSTEP heritage, and that's just how it is.

Dean Shavit: In a microkernel OS, would it have been more difficult or easier to implement FUSE?

Amit Singh: It would have been a bit easier in some areas.

Dean Shavit: Have you ever worked with a Microkernel-based OS?

Amit Singh: A few: GNU HURD, Minix, and a bunch of academic systems. These days, "monolithic" systems are not as monolithic as they used to be. Just like how RISC and CISC processors adopted each other's features over time, "monolithic" systems tried to be not so monolithic too.

Dean Shavit: I understand. I'm going to guess the reason that MacFUSE requires Mac OS X 10.4 is because Apple published a KPI designed to formalize some of these interfaces.

Amit Singh: Yes, before 10.4, writing a file system for Mac OS X was much more painful

Dean Shavit: So FUSE is a filesystem in its own right, with its own extensions...

Amit Singh: Yes, MacFUSE looks like a regular file system to the OS X kernel. It frees you from having to worry about everything else except the data that you want to provide from your user-space file system.

Dean Shavit: Right, I've seen it at `/dev/fuse`

Amit Singh: Yes, although `/dev/fuse` here doesn't work like a disk device. MacFUSE uses `/dev/fuseN` devices for kernel-user communication.

Dean Shavit: Since I started investigating FUSE and using MacFUSE, I've thought that the notion of "File Systems in User Space" was a bit misleading, as you do need kernel level support first, and that's what you've given to the Mac OS X community. I'm already using sshfs for web development, though my attempts at using it for an iTunes library weren't as successful. There must be an overhead/performance penalty for the ability to load these in userspace... I found that the data

stream would stop and start, whereas using AFP over a VPN didn't have that issue.

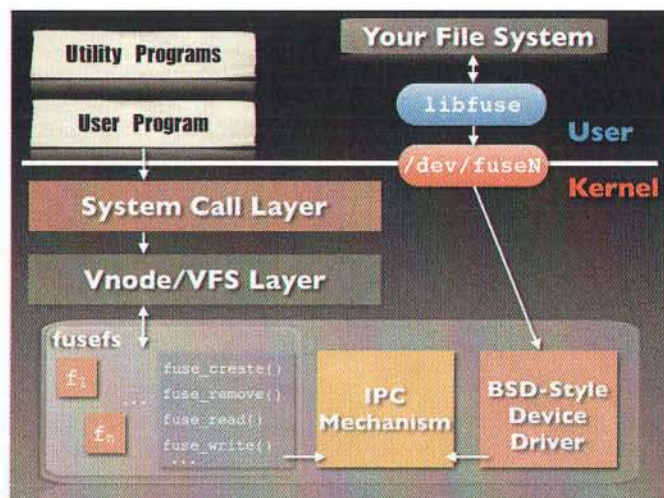





Figure 2. MacFUSE Architecture from Amit Singh's MacWorld 2007 Presentation "Taming Mac OS X Filesystems"

Amit Singh: MacFUSE itself doesn't have a huge overhead—much less than what one would tend to imagine. sshfs, the user-space file system, is more of a utility file system right now than a general purpose file system. The other thing, which I see as a bit of a problem, at least initially, in the Mac OS X world is that MacFUSE (and things like sshfs) have too many "knobs". Meaning, too many options and things you can tweak.



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Dean Shavit: I'm beginning to find that out. I love being able to mount a directory on any folder instead of pre-defined shares. But I like the knobs! But I also know a few folks who want to write GUIs for sshfs as well...

Amit Singh: Just by its nature (it can support any type of user-space file system), there's not one set of reasonable defaults.

Dean Shavit: Please please please don't cut down on the command-line options!

Amit Singh: I think it's important in the Mac universe to not expect users to be well versed with these knobs — no no, I am not talking about taking them away, just that I find people asking for features that are already there.

Dean Shavit: Some will find it way too geeky for them, but that's life — as if ssh and openssl didn't have a zillion knobs on their own. Leave it up to us hybrid developer/sysadmins to create reasonable GUIs for these FUSE filesystems.

Amit Singh: My personal experience with sshfs has been quite good—I do use it for playing QuickTime video.

Dean Shavit: On a local network or over the internet?

Amit Singh: My experience is on a LAN. Plus, playing songs (in your case) doesn't even sound like a lot of throughput requirement.

Dean Shavit: Agreed, it should work for me; maybe I need to turn a few knobs.

Amit Singh: Also, please just ditch the existing release when 0.2.0 comes out.

Dean Shavit: Another thing—I am having a bit of a tough time navigating through the MacFUSE project. Let me explain.

Amit Singh: OK.

Dean Shavit: First, the Google Code pages aren't what I'm used to when it comes to working with an Open-Source project — they take a bit of getting used to. Second, it's not entirely clear to me where your (and Google's) involvement in the MacFUSE project begins and ends.

Amit Singh: Well, as far as I'm concerned, MacFUSE is just the core (the kernel extension, the user library, and the internal mount utility, etc.)

Dean Shavit: For example, just now you mentioned that you had some concern about sshfs being more user-friendly....yet in reality, the MacFUSE project really ends in with the kernel-level support, right? Or do you and Google intended to take on support, and source code management for the binary builds for FUSE?

Amit Singh: This being a part-time project, there simply aren't enough cycles for me (or anybody else on my team) to support all kinds of file systems.

Dean Shavit: Understood.

Amit Singh: We did it (so far) to get people jumpstarted.

Dean Shavit: That makes perfect sense to me.

Amit Singh: You might have noticed that I'm moving all sshfs related issues to a new status on the project page: "NeedVolunteer" And fortunately, people are stepping up!

Dean Shavit: Well consider me one of the volunteers; I'll do what I can!

Amit Singh: Thanks, and we'll help you every way we can.

I'm under no illusion that just having a solid and robust core (the kernel extension) will make users happy! After all, this "is" the Mac universe. People have been demanding better UIs since day one.

Dean Shavit: Don't I know that, but after a while, the ROI for small single-purpose GUIs isn't always worthwhile. For example, I love your command-line tool "HFSDebug" but I don't see any reason to write a GUI to expose every "knob" to the end-user.

Amit Singh: Also, like the demos I showed (not sure if you have seen the video), the file system just becomes an application that you launch.

Dean Shavit: I have seen the video. [Note: the video is a must-see, and is linked off the main MacFUSE project page]

Amit Singh: Technically, we aren't maintaining the user library either. I only released a patch that you apply to the library available from the FUSE web site. What would also be useful on Mac OS X is, say, an Objective-C "wrapper" library on top of the Unix-style libfuse.

Dean Shavit: I'm also thinking that the effort to support MacFUSE filesystems should start at the project level to add direct support for configuring and compiling filesystems on Mac OS X into the existing projects that

currently only compile on Linux.

Amit Singh: Oh, I didn't say I'm not maintaining the *patch* Release 0.2.0 will have a patch for 2.6.3.

Dean Shavit: I know one of the things I found a bit unclear when I went to compile MacFUSE was if I should be using the new libfuse or 2.6.1. It would help if that were listed under system requirements.

Amit Singh: When compiling from source?

Dean Shavit: Right, your exact words "Suppose you downloaded fuse-2.6.1.tar.gz." At the time, both 2.6.2 and 2.6.3 were available. So I had to guess.

Amit Singh: Right...thanks for your feedback.

At this point though, the binary package is really the preferred way to install.

Dean Shavit: Does installing the binary allow for folks like myself to compile FUSE filesystems?

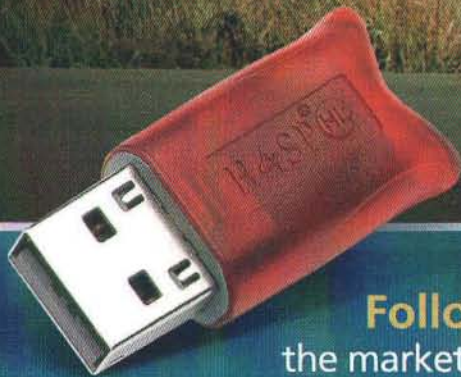
Amit Singh: The binary package gives you the FUSE user-space library (libfuse) and the header files. If you're writing a new file system just for Mac OS X (that is, you don't care if it's portable), there's no reason to use libraries that don't exist already on Mac OS X, so you should be fine. Some Linux FUSE file systems do need things that don't exist on Mac OS X by default, so you have to go find those dependencies first.

Dean Shavit: And that's where I'm having some trouble.

With release 0.2.0, MacFUSE supports ACLs ... it already supports extended attributes

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Amit Singh: The very first MacFUSE binary tarballs contained the most common of these dependencies (glib), but that was a maintenance nightmare for us.

Some people didn't want those binaries, some wanted them in different locations (because some use Fink, some use MacPorts, some compile their own stuff)

Which is why I decided to just focus on the "Core". Because that's what benefits people the most in the long run (if that's robust and featureful).

Dean Shavit: On my main development machine, I couldn't get anything to compile because of conflicts with both Fink and MacPorts (formerly Darwinports). When I started with a clean install, I was then able to "attempt" to compile some filesystems from Linux, but with no successes yet.

Amit Singh: Which file system were you trying to build?

Dean Shavit: I tried CopyFS and wayback as well, sometimes referred to as "the poor man's Time Machine."

Amit Singh: I think those two (and some others as well) are among the ones that have way too many external dependencies

Dean Shavit: As I see it, there's going to be three main types of users for FUSE:

First, there's going to be application developers who will want to write their own FUSE filesystems. I can think right away of one company (Delicious Monster) that would see an immediate benefit – by allowing users to browse and open books, DVDs, and other catalog items from the Finder that were published in Delicious Library. Also, there's a class of

aggregation or notebook software solutions such as Circus Ponies Notebook or Yojimbo that act as a place to "throw" images and text snippets for better searching. I think having MacFUSE available will result in some pretty cool implementations in the next twelve months if developers like the ones I've mentioned decide MacFUSE will help their products.

Amit Singh: I agree.

Dean Shavit: Second, there's the group that I belong to, the "hybrid" sysadmin / developer who may write AppleScript Studio interfaces or Cocoa interfaces to command line tools. For us, we're going to be looking to MacFUSE for things like backup, remote access, system monitoring, access to drives and disks from other OSes and possibly workstation management. We're going to be the group most likely to want MacFUSE to support MacPorts of Fink for its implementation of pkg-config, and we're also going to be the ones who are going to need things spelled out a bit more than the devs.

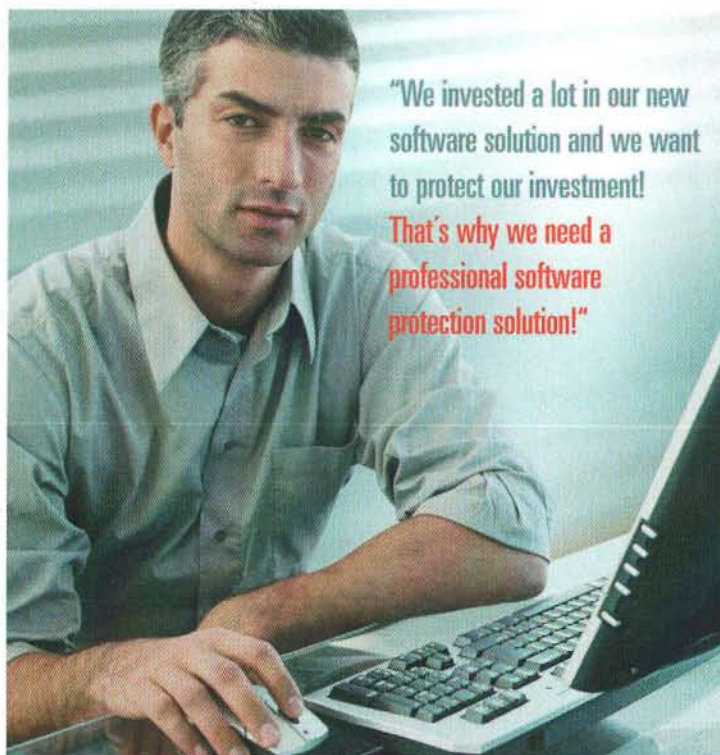
Third, there's end users who should only see the benefits, not the knobs. But right now, there's not much for them.

Amit Singh: Yeah, that sounds about right.

Dean Shavit: I'd like to see the Google Project Page for MacFUSE offer three links, one for each audience.

Amit Singh: It hopefully will, in due time.

Dean Shavit: So yes, I've had some trouble compiling Linux file systems, but I also want to write one. I have an idea



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for one that you could probably finish in a hour, but that would take me weeks.

Amit Singh: Sure. [I] just want to point out that Google has been wonderful in letting me work on this, and then letting me release this as open source. Still, at least as far as the MacFUSE Core part goes, it's pretty much a one person "personal" project, which means whatever time I get to work on it, I have to use it judiciously. This is also why community involvement is so critical.

Dean Shavit: Yes, kudos to Google for giving you the time to pursue MacFUSE, I'm sure that Google also might be among the first to use it for its own Mac OS X Software! With all of the Web 2.0 development that Google's currently working on, it makes a lot of sense to bring that data down to the desktop as a mountable filesystem for the end-user. About developing for MacFUSE, somewhere in fuselib there's a method to take a list of posix paths and convert them to a file system...

Amit Singh: Which method? do you remember?

Dean Shavit: I am just guessing based on what I've seen, hang on....Let me have a peek at the source...Well the docs say that your arguments are passed from your user mode program to `fuse_mount()` and `fuse_main()`, so either I have to bone up on the API or look at an example.

Amit Singh: There's an example file system in the source of FUSE 2.6.3: `fusexmp.c`.

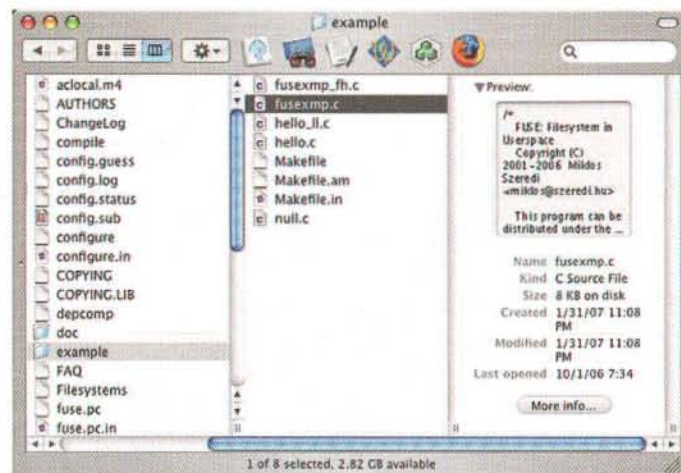


Figure 3. Fuxsexmp.c from FUSE source code.

Amit Singh: That acts as simply a wrapper atop your regular file system. Fusexmp can be a good starting point for a MacFUSE file system.

Dean Shavit: The idea I have is called "pkgfs" that would allow someone to mount `/Library/Receipts` and browse the contents of the BOM files as links, thereby navigating to the files when clicking on them.

Dean Shavit: So I'd have to look into adapting fusexmp.



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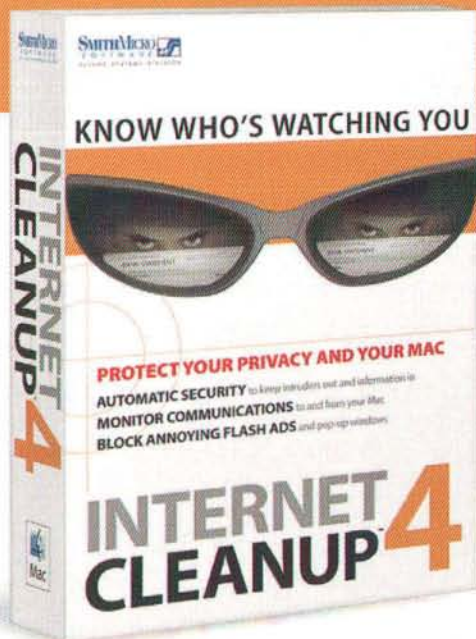
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Amit Singh: I think looking at `hello.c` and `fusexmp.c` both should get you started. `Fusexmp` has all the methods you'll need and `hello.c` has an example of how you can generate a file on the fly.

Dean Shavit: What does it do?

Amit Singh: it remounts your root on another directory. It's just a pass-through file system. So I say "`fusexmp /tmp/foo`", and now `/tmp/foo/` contains what I have in `/`, so I can even go `/tmp/foo/tmp/foo` (recursively), not that that's a good idea... *grin*

Dean Shavit: So a listing in POSIX path form could easily be passed as a filesystem, makes sense to me.

Amit Singh: Yup.

Dean Shavit: OK, that brings me to my next question. Once you've presented a mountable filesystem, there's all sorts of other factors that come into play, such as directory services, extended attributes, ACLs, re-sharing file systems over a network, etc. How have you been able to adapt MacFUSE to Apple's unique file system and extended attributes and directory services. Have you investigated re-sharing an `sshfs` mount over AFP, for example?

Amit Singh: With release 0.2.0, MacFUSE supports ACLs ... it already supports extended attributes (and has better support in 0.2.0). It's quite nice actually: if your user-space file system implements extended attributes, MacFUSE will let it handle them. If not, MacFUSE will handle them for you as Apple Double ("._") files. So you can right away, with `sshfs` or whatever, enable ACLs, use apple's tools to set these ACLs, and have the ACLs come into effect.

Dean Shavit: The fact that you would go through the trouble to support ACLs makes me think that MacFUSE might have a future in the enterprise computing arena.

Amit Singh: Well, I did it because it seemed like a natural thing after I put in extended attributes support. (Apple stores ACLs in extended attributes)

Dean Shavit: That's really incredible. It opens up all sorts of possibilities.

Amit Singh: Similarly, MacFUSE also supports `kevent/kqueue` now and it already supports `fsevents` (the notification mechanism that Spotlight uses) and Kauth (the kernel-level notification mechanism that virus scanners use). So it really supports a whole lot of things that way.

Dean Shavit: Gosh, wouldn't it be nice to be able to "mount" your quarantine folder as a separate filesystem....I read your release notes, and was intrigued by the mention that `kqueue` and `kevent` use an "unsupported Apple API" does that mean undocumented or unsupported like a menu extra vs. a menulet extension?

Amit Singh: No, unsupported here means that Apple has put it in an umbrella called "unsupported" (in the kernel

interfaces section) ... either Apple will not take this interface away, and if they do, it will be to provide a better interface

So it's "supported" in that MacFUSE is not intercepting any functions or patching memory etc. It's just that apple has earmarked this particular (`kevent/kqueue`) thing as something that "could go away in future."

Dean Shavit: So MacFUSE is not performing any code injection, or relying on any undocumented kernel interfaces?

Amit Singh: No, not at all. Well ... it's ironic ... but a lot of the "documented" stuff is "undocumented" in the os x kernel ... so I find your question amusing *grin*, meaning, it's /supported/, but Apple hasn't had the time to document it.

Dean Shavit: That's great, I'm sure many people who have heard of MacFUSE have wondered if that's the case. That means that forward-compatibility is almost 100% guaranteed for Leopard and beyond, till Apple drastically changes its KPI.

OK, so here's a question: other than yourself, how many developers can navigate the uncharted kernel space? There must be a handful outside of Apple. I did notice that Apple referred back to the `mklinux` project for more elaborate documentation for MACH! Did you ever work with `mklinux`?

Amit Singh: I've played with `mklinux`, but it was much "before my time."

Dean Shavit: So, is much of the work with the support but undocumented kernel APIs trial and error, or is there a logic to it?

Amit Singh: No no ... it's even documented that "please use these interfaces" — that much is documented. Apple just hasn't had the time to describe them (like systems like Solaris

and AIX have — voluminous kernel documentation)

So there's nothing kludgy or hacky here. Besides, that's one reason why I wrote "Mac OS X Internals" — I believe people should find that useful for kernel work.

Dean Shavit: Right, but how did you "discover" that information?

Amit Singh: Oh ... that's just studying the system ... I do operating systems for a living, after all, so it's just "work"

Dean Shavit: So was that a lot of `kttracing` and memory dumping? Which tools did you rely on?

Amit Singh: Most of what's available on Mac OS X, plus many that I wrote (the source of which is in the book), reading the source, and experience from other operating systems.

Dean Shavit: I remember very well your open challenge to the Mac OS X community to figure out the "PanPipes" and how it exploited a flaw to cause a kernel panic. I thought that was both fun and interesting! The moment I heard about MacFUSE, I thought "this is similar technical challenge, but everyone's going to win."

Amit Singh: Heh ... that's an interesting way to put it. I really do hope people benefit from MacFUSE.

I for one hope that they take the gift you've given Mac OS X and consider it seriously for inclusion in the OS.

Dean Shavit: If you expose a flaw, many people might learn something. But this time you've exposed what might amount to be a gold mine of file systems. Have you had any direct feedback from Apple engineers about this terrific accomplishment? I know Apple's trying to bring Leopard more into the UNIX mainstream. It seems like FUSE might be a natural fit for that initiative.

Amit Singh: No, I haven't had any MacFUSE-related communication with Apple engineers after we put this out.

Dean Shavit: Well I'm sure they're busy updating Launchd and the binaries for UNIX certification. Have you submitted MacFUSE to MacForge in any formal way?

Amit Singh: No.

Dean Shavit: Do you think Apple would do its own FUSE implementation at any point?

Amit Singh: I can't speculate on Apple's plans. We have release MacFUSE under an open source license, so Apple and whoever else are welcome to do what they please under the terms of the license.

Dean Shavit: It would be much more widely used if it were part of the Mac OS X distribution.

Amit Singh: Right, but that's really up to Apple.

Dean Shavit: However, one of my hats is a journalist's Fedora, so I will speculate that they won't include it unless it picks up a lot of end-user support, and if they do, they'll probably re-write it from scratch, and perhaps build it directly into the kernel.

Amit Singh: Sure, but I don't see why they would rewrite it from scratch.

Dean Shavit: (Fedora off). I don't see why either. Well I for one hope that they take the gift you've given Mac OS X and consider it seriously for inclusion in the OS.

Amit Singh: Apple has very good and very pragmatic programmers.

Dean Shavit: You've had three releases of MacFUSE since MacWorld, and the stability and improvement have been rapid. Is there some point where you'd feel MacFUSE was mostly "done" or is there a list of improvements you're looking to make in the next few months?

Amit Singh: I think with 0.2.0, most of the features I wanted to put in will be there. I expect that I'll be focusing on bugfixes and optimizations mostly, but you never know.

Dean Shavit: And once MacFUSE is in maintenance mode, which other missing capabilities of Mac OS X are you considering bringing to the platform?

Amit Singh: Ah that's hard to say. I always make this resolution that 1) I'll not work crazy hours and 2) I'll give Mac OS X a rest and pursue other areas ... somehow, I always fail to keep the resolution

Dean Shavit: I'm very familiar with #1, but frankly haven't considered #2! Well, thank you very much for your interest in Mac OS X. May you never have time to pursue those "other areas"!

Amit Singh: Thank you for your interest in what I do.

Getting Started with MacFUSE - sshFS

Getting going with sshfs takes just a few minutes.

First, download the latest binary of MacFUSE from <http://code.google.com/p/macfuse/>, install it and reboot. Then, put the sshfs application in your /Applications folder. Then, create a directory in /Volumes using the following terminal command:

```
macbookpro:~ dean$ mkdir /Volumes/mymount
```

then:

```
macbookpro:/Applications/sshfs.app/Contents/Resources dean$ ./sshfs-static  
mostadmin@www.macworkshops.com:/Library/WebServer/Documents/Macwor  
kshops /Volumes/mymount/ -oreconnect,ping_diskarb,volume=Macworkshops  
mostadmin@www.macworkshops.com's password:  
kextload: /Library/Extensions/tusefs.kext loaded successfully  
mostadmin@www.macworkshops.com's password:
```

The mounted sshfs volume appears, like any other network volume, mounted at the directory specified with the label specified. It's accessible as any other local or network volume on the system.



Figure 4. Mounted sshfs file System.

Getting Started with MacFUSE - SpotlightFS

Using the SpotlightFS application is a snap. Just download it and create a folder inside the mounted SpotlightFS volume. Any pre-existing Smart Folders will also appear there. SpotlightFS lets you look at your Smart Folders as if they were actual volumes. If you write a script that will follow the symbolic links, you may even be able to back up using Smart Folder selection criteria.





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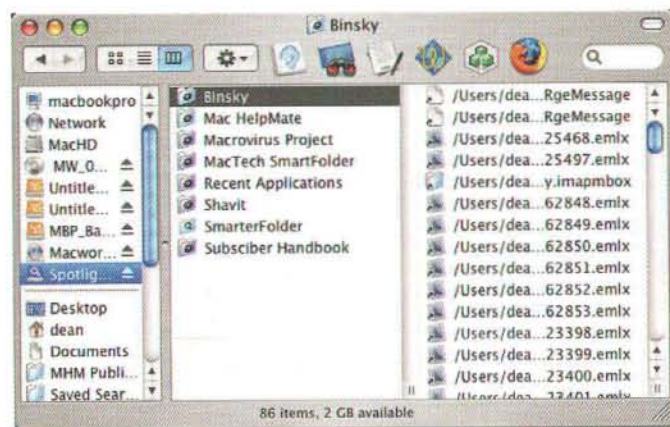


Figure 5. Mounted SpotlightFS.

MacFUSE Resources

The FUSE Main Project page: <http://fuse.sourceforge.net/>
Filesystems based on FUSE:
<http://fuse.sourceforge.net/wiki/index.php/FileSystems>
MacFUSE Main Project Page:
<http://code.google.com/p/macfuse/>
"Taming Mac OS X File Systems":
<http://googlemac.blogspot.com/2007/01/taming-mac-os-x-file-systems.html>
Amit Singh's Mac OS X Internals Site: <http://osxbook.com/>

Next Time...

By the time this issue of MacTech hits the newsstands, I should be finished with our current product development cycle (and boy it sure was a long and demanding cycle) and I should be back to writing more regularly. I'm not sure what I'm going to write about, but I have a feeling that MacFUSE may play a part, especially if I decide to write "pkgfs" (or more specifically, if I'm able to write it).

MM

About The Author



Dean Shavit is an ACSA (Apple Certified System Administrator) who loves to use a Mac, but hates paying for software. So, he remains on the hunt for the best Open-Source and freeware solutions for Mac OS X. Besides surfing for hours, following the scent of great source code, he's a partner at MOST Training & Consulting in Chicago, where he trains system administrators in Mac OS X and Mac OS X Server, facilitates Mac upgrade projects for customers, and writes for his own website, www.themachelpdesk.com. He also the creator a Mac HelpMate, a widely-used troubleshooting and remote access tool, available at www.machelpmate.com. If you have questions or comments you can contact him: dean@macworkshops.com.



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MAC IN THE SHELL

by Edward Marczak

Which Log?

Following up on which log shows you what

Introduction

I've had incredible response to my last two columns that talked about logs: what they are, how to interpret them and how to notify yourself if a log is telling you something important. More than any other question, however, people have asked, "which log does what?" While I gave an overview of some logs, there are plenty more that I haven't gone into, and more locations for logs than I could describe previously. That's what I'll be following up on this month. So, read on for even *more* on logs.

Kinda I Want To

Just as a review for anyone who didn't read the previous columns, logs are text files that running programs write to that keep track of their activity. Text files, that's all. (OK, an app *could* keep a binary log, but for the most part, text it is). This allows other apps and, more importantly, humans to read their contents. Apps are free to deal with logging on their own, or, they can use syslog to hand off their data to the *system logger*. It's a bit of a style issue, and usage is roughly split on which method is chosen. There's nothing that says that an application can't do *both*. Let's look quickly again at the syslog method.

The system logger, aka "syslog", is a daemon run at boot that should be running all of the time. It listens for logging data locally, and knows where to put a logging entry based on its configuration file `/etc/syslog.conf`. "syslogd" can also be setup to listen for logging data from other machines as well. Log data can be categorized by facility and level (a "selector"). The facility is basically where the data is coming from ("mail", "ftp", etc., along with some generic facilities). The level describes the severity of the log message. The currently defined levels are:

Emergency	(level 0)
Alert	(level 1)

Critical	(level 2)
Error	(level 3)
Warning	(level 4)
Notice	(level 5)
Info	(level 6)
Debug	(level 7)

(Don't you love it when things neatly fit into a byte?) Looking at `/etc/syslog.conf`, you can then see which messages will be directed to which files. Note that some will go to *multiple* files.

This is a bit of a review, as all of this (and more) was covered in previous articles in this column.

Down In It

Apple has created a little bit of a split with logging: "Unix-y" files in `/var/log`, and everything else. While that may be a bit of an overgeneralization, it's a good general guideline.

syslogd, as you can see from `/etc/syslog.conf`, will dump just about everything in some log residing in `/var/log`. Additionally, several non-syslog sending services also drop their files somewhere into the `/var/log` hierarchy. The two big notables in this category would be apache – logging into `/var/httpd` – and samba, which logs into `/var/samba`. You'll also find some other non-syslog-ish files hanging around in `/var/log`, and we'll address those a little later.

The other place you'll find good logging information falls into the "everything else" category. You'll find these in `/Library/Logs` or `~/Library/Logs`. System processes will log to `/Library/Logs` and user processes, when the user home directory is writable, will log to `~/Library/Logs`. For example, anything that needs admin level rights to run – AFP logs, Software Update and, my favorite, Directory Services – will log to the System directory `/Library/Logs`. Other user-space apps – Logic, SyncServices, Parallels, etc. – will log into the user's own `Library/Logs`.

If you've peeked into either of these directories, you'll notice that there's another category of logs: logs that get generated as the result of a crash.

Something I Can Never Have

For those of you obsessed with the running process list, you'll no doubt have noticed the persistent `/usr/libexec/crashreporterd`. Apple's crash reporter daemon hangs around waiting for an application to crash. Technically, it listens for a Mach exception to be generated, and, upon that happening, launches `crashdump`. `crashdump` then logs and reports the event to the user. If the user can be determined, and they have a writable home, the report goes into `~/Library/Logs/CrashReporter`. You really forget how much stuff takes a dive until you peek in there:

```
Jack-Kerouac:~/Library/Logs/CrashReporter marczak$ ls -l
BOMArchiveHelper.crash.log
Cyberduck.crash.log
Dreamweaver.crash.log
```



```
Finder.crash.log
GrowlTunes.crash.log
Mail.crash.log
Now Up-To-Date.crash.log
Pages.crash.log
Parallels.crash.log
Preview.crash.log
Quicksilver.crash.log
Safari.crash.log
VirtueDesktops.crash.log
Workgroup Manager.crash.log
firefox-bin.crash.log
iSnip.crash.log
mdimportserver.crash.log
vmware.crash.log
```

Wow. When an app's owner can't be determined, is a system process, or the user's home directory is not writeable, crashdump logs into /Library/Logs:

```
Jack_Kerouac:/Library/Logs/CrashReporter root# ls -l
ARDAgent.crash.log
Exited process.crash.log
httpd.crash.log
iSnip.crash.log
loginwindow.crash.log
```

LoginWindow crash...I like that one! crashreporter itself, however, logs its actions into /var/log/crashreporter.log. Finally, crashreporter is also responsible for writing panic logs when the system is rebooted after a panic – find the log at /Library/Logs/panic.log.

Terrible Lie

If you root around /var/log long enough, you'll even start to notice some other files that aren't syslog generated at all. The most notable of the bunch are daily.out, weekly.out and monthly.out. These log files are generated by the daily, weekly and monthly periodic jobs that run overnight (if your machine is up and running, but not necessarily logged in).

Also of note are wtmp and lastlog. Interestingly, these are binary log files, and must be read with another application. These are not present for troubleshooting per se, but instead track login activity. User IDs, along with their login time get written to lastlog. From there, the utmp file gets updated with the user login information, and the same utmp record gets written to /var/log/wtmp. users, w and who use utmp to provide their information, while last and ac use wtmp.

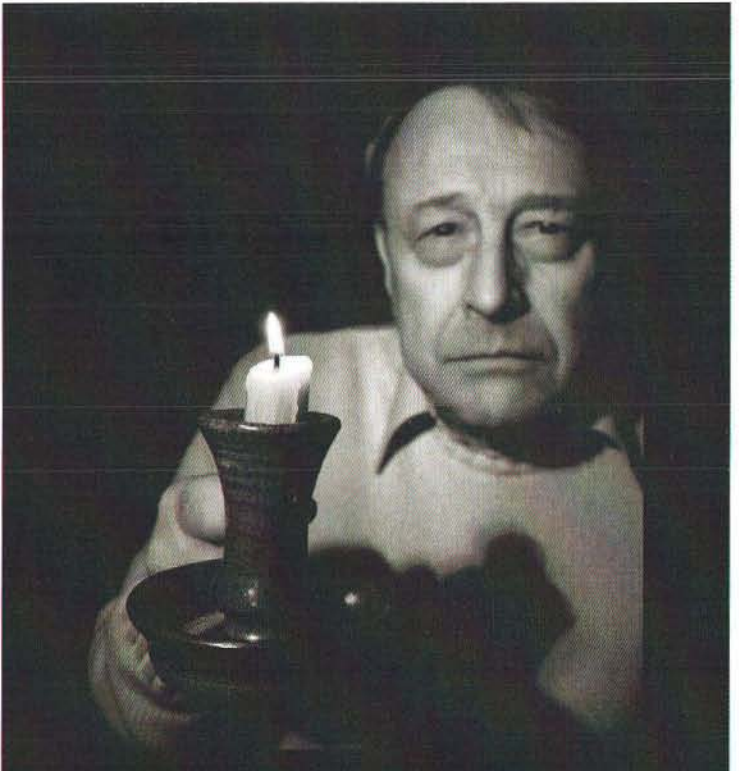
That's What I Get

So, back to the original question: which logs record which bit of information? Here's a 40,000 ft. view:

/var/log/system.log

Along with asl.log, these are the big kahunas. Most system related activity is logged here. Specifically, the following selectors log to system.log:

```
*.notice
authpriv.remotetauth.ftp.install.none
kern.debug
mail.crit
```



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As mentioned in January, `asl.log` pretty much gets everything, and displays the facility and level with the log message.

/var/log/secure.log

Messages from Apple's SecurityServer get logged here – along with anything in the `authpriv` facility. Good one to keep an eye on. Interestingly, though, some security-related information logs to system log as well (such as `sshd` authentication errors through PAM).

/var/log/mail.log and /var/log/mailaccess.log

Complimentary logs that describe mail (if you're running OS X Server's built-in mail – OS X 'client' also uses `/var/log/mail.log`). `mail.log` contains activity for postfix, SMTP sending and receiving while `mailaccess.log` contains cyrus' imap and pop activity. `mail.log` is the place to look when clients are telling you that they sent mail that the intended recipients never received (mail going out), or that someone sends them e-mail which they themselves never received (mail coming in).

/Library/Logs/DirectoryService/*

Huge. HUGE I say! Anyone operating in an OD, AD or other LDAP-reliant environment should be checking here occasionally. Of course, if you're trying to bind a workstation to a directory, and

it's just not working for some reason, this is the place to check. Don't forget to throw `DirectoryService` into debug mode (killall -USR1 `DirectoryService`, logging to `DirectoryService.debug.log`), or use `boot-time` debugging (touch `/Library/Preferences/DirectoryService/.DSLogDebugAtStart` – which will also log to `DirectoryService.debug.log`) if the situation calls for it – covered in detail in past Mac In The Shell articles.

Logs that you don't need explained

There are some logs that simply don't need any explanation. These include:

```
/var/log/ftp.log (contents of the ftp server)
/var/log/httpd/* (Apache's log files)
/var/log/samba/* (Samba's log files)
/var/log/lpr.log (lpr printing activity)
/var/log/cups/* (CUPS web sever activity)
/Library/Logs/Software Update.log (Software Update install history)
```

`/Library/Logs/AppleFileService` – OK, perhaps this one does need some explanation. But not by me – from the engineers at Apple. This *should* be the Mecca of information that you reach for when you want to track activity coming in through AFP. However, details in this log are so sparse to render it useless. Despite the fact that `AppleFileServer` runs as one grand, monolithic process, we need it to give up the goods on what's happening internally in these logs.

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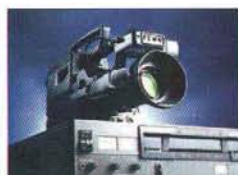
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The mega-log

Remember, that you can always have all syslog messages be delivered to a single file by using a wildcard selector in `/etc/syslog.conf`:

```
.* /var/log/mega.log
```

...although `aslog` is already catching most of that. Further remember that this will not capture everything else that is performing logging on its own and not using `syslog/asl`.

The Only Time

While I made a strong case for watching and examining logs using good 'ol Unix tools – `grep`, `tail` and `less` – and I would still make that assertion, there are some other very useful tools out there.

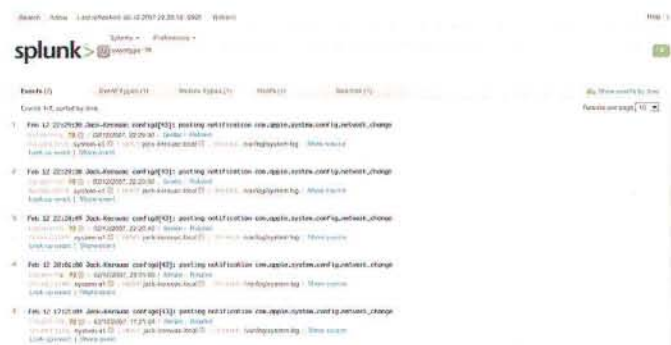


Figure 1: Splunk searching for events

`Console.app` is the most obvious for us Mac users; it's "built-in" and clearly Mac-like. I still think it's a miserable way to follow log activity as it happens, but it is a fantastic tool for exploring the various logs that exist on the system. Fire up `Console.app` (located in the Utilities folder) and poke around. It's a great learning experience.



Figure 2 – Splunk showing the frequency of various events that appear in a given source.

I've found a newer tool on the market to also be very useful, and while it's not Mac-specific, it's nice that there's an OS X version at all. Splunk is billed as a logfile search engine. It comes in a free version that will sift through up to 500MB of logs per day, and a paid version which not only removes that restriction altogether, but also adds Splunk-to-Splunk logging for log correlation across many machines, and also authentication which is missing in the free version.

Splunk alone could take up an entire column (and may very well one day soon); it is so easy to get going, that I'd

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recommend the download. Excellent documentation exists on the site as well. Of course, Splunk makes it really easy to search for events, but I've found that it's a nice exploratory tool in general. Splunk quickly categorizes events and can let you filter on those events. Figure 1 shows the search engine, running in a browser, looking at event type 9 on my machine.

Even cooler, perhaps, is the ability to look at the frequency of events. Figure 2 shows the frequency of events that appear in the secure.log of my machine – clearly a good one to keep an eye on and reign in this kind of data.

In a small-to-medium sized organization, you could set up a single server as a log host (check the prior logging articles for instructions) and have Splunk access that log. 500MB is a *lot* of logging information. Enough that you shouldn't have a problem using the free version of Splunk.

Sanctified

So here's the real story with logs: you can ignore them, sure. Then when a problem crops up, you can just tell your client/employer that this is just the way computers are. There are bugs, there are problems; such is life. If you watch the logs, you'll know there's a problem, and then you'll actually have to do something about it.

Or, you can realize that this is the only way the system can speak to you and more often than not, you're warned well in advance of any catastrophic problems. You can head these off at the pass. You can keep the system providing services without interruption and keep up with *real* work.

Of course, the unfortunate cases do arise where you need to ascertain what happened after the fact. Did that mail get sent? Did that volume bomb on space and then recover without us really knowing? Was someone trying to brute-force a login through ssh at the same time our web server was under attack? In those cases, knowing which logs to look in and how to read them are your only resource for piecing together information after an event took place.

Media of the month: you might suspect it would be some Nine Inch Nails title, however, I'd have to disappoint: that was only a passing fancy. The real Media of the Month is, "Innumeracy: Mathematical Illiteracy and Its Consequences" by John Allen Paulos. A book that I forgot I had until I lent it out. Easy, enjoyable, powerful reading.

WWDC time again! Apple has announced the dates (June 11th through the 15th, if you'd missed it), so, get ready. If you're attending, I hope to see you there in person! Until then, though, I'll see you in print next month..



About The Author

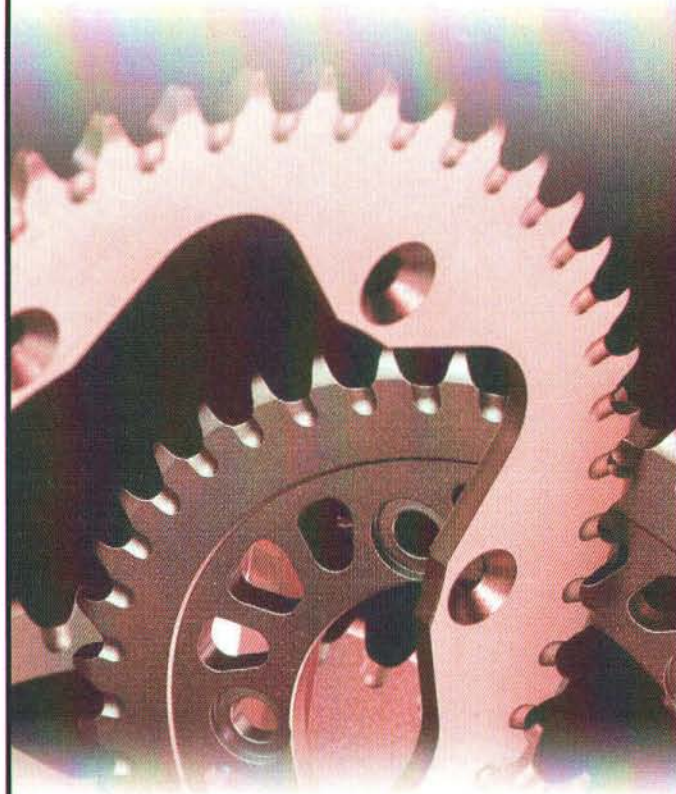


Ed Marczak owns and operates Radiotope, a technology consultancy that brings enterprise solutions to small and medium-sized businesses. Outside of this piece of the puzzle, he is Executive Editor of MacTech Magazine, a husband and father, and CTO of WheresSpot, among other things. Find the missing tech piece at <<http://www.radiotope.com>>.

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Virtual Reality

Which solution is right for me?

By Philip Rinehart, Yale University

So many choices

In 2005, when Steve Jobs famously stood on stage at the Worldwide Developer Conference and announced the transition to the Intel processor, some wondered what it would mean for the future. In particular, the question of virtualization almost immediately surfaced. Would Mac users now be able to run Windows-based applications? Would it be seamless? Would it be fast? Almost eighteen months later, the number of choices is astounding. Before we start, though, an important note: VMware is still a **beta** product, and the newest version of Parallels is also not complete. Even though both products are not final, each can be analyzed on their relative merits.

VMware

Why start with VMware? Perhaps one reason to start with VMware is its long track record with virtualization products. Let's examine some of what VMware brings to the table.

USB Support

As VMware has had eight years of development for Intel processors, the Fusion beta brings full USB 2.0 support to the table. As a result, almost any device that is attached works at its full native speed. How huge is this? Let's take a look at the interface.

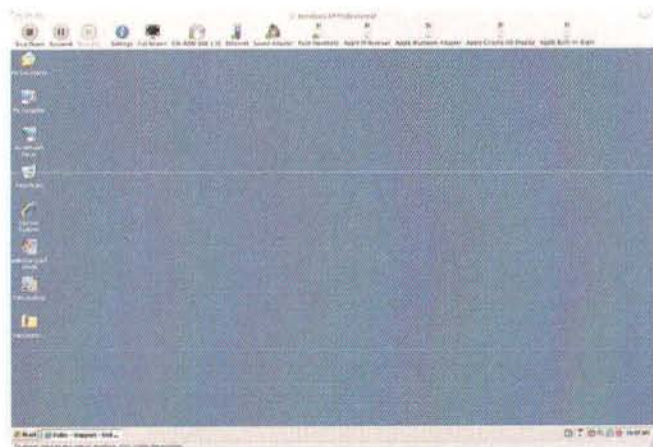


Figure 1

Figure 1 shows a Palm Treo 700p connected. If the device is connected at a low speed, Windows XP warns about a low speed device being connected. Note also the complete list of USB devices across the top of the interface. Each can be enabled or disabled with the simple click of the button. Also included is the Apple IR receiver, the Bluetooth adapter, and the built-in iSight. Before each can be activated however, a Boot Camp driver disk is needed, as Windows XP does not include drivers for Apple specific hardware.

SMP Support

Multiprocessor support, SMP, allows both cores of the Intel Core 2 Duo to process information. Programs that have been optimized for multithreading can take full advantage of both processors. Additionally, operating systems that have been optimized for 64-bit operation can be used, including almost any version of Linux, Windows XP 64-bit, as well as other BSD operating systems. How easy is it to configure?

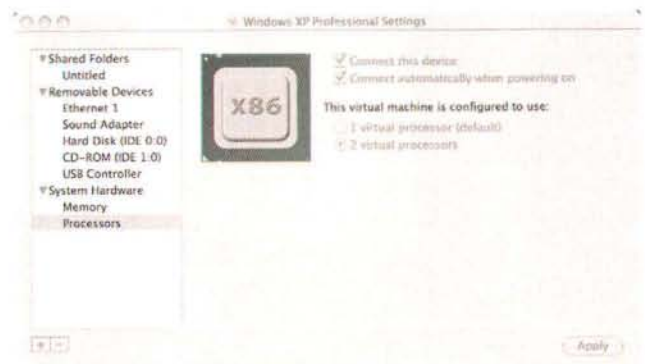


Figure 2

Figure 2 shows the VMware interface as it exists today. By default, the virtual machine will use a single processor, but a simple click enables the use of 2 processors. As described by VMware, it is a 'dead simple' way to activate both processors. Figure 3 shows how it is enabled at installation time.

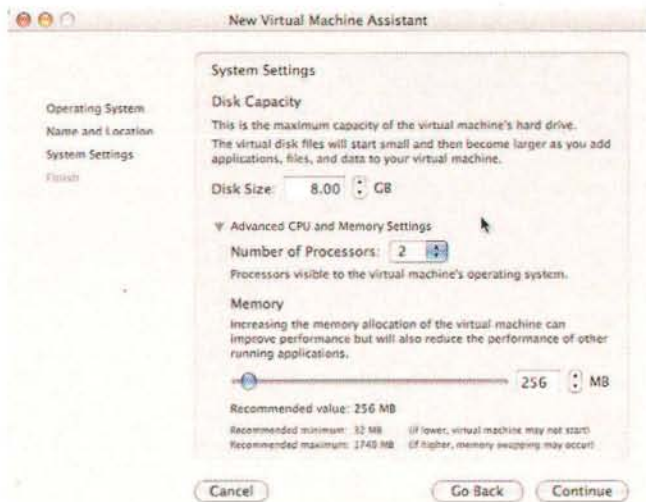


Figure 3

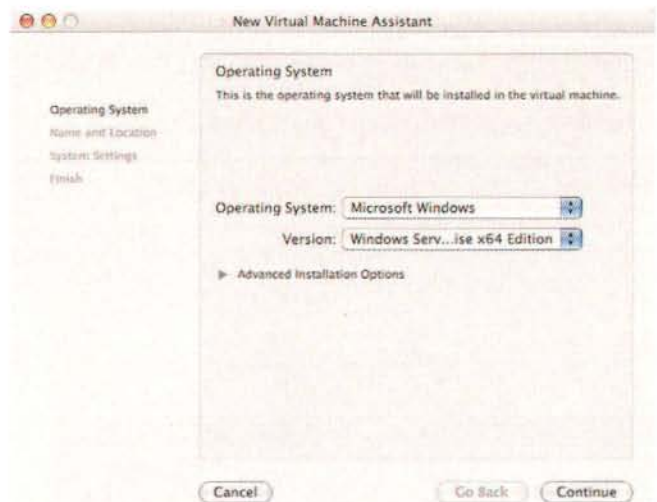


Figure 4

64-Bit Support

While a relatively small number of programs take advantage of being able to run in a 64-bit environment, it can be needed by certain applications that take advantage of a 64-bit architecture. In particular, running Windows 64-bit server versions is simply done. At install, choose the appropriate 64-bit operating system. Figure 4 shows an installation of Windows Server 2003, Enterprise edition.

If a 64-bit operating system is a requirement, VMware fulfills that need.

VMware Virtual Appliance Marketplace

The availability of the Virtual Appliance Marketplace is perhaps one of the most interesting aspects of running VMware Fusion.

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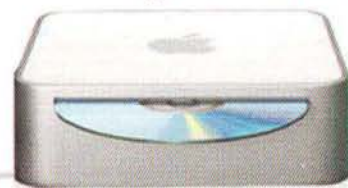
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Many different appliances have been pre-created, and simply require a download. Everything is preconfigured from the start, allowing evaluation of technologies and products without the configuration overhead. It is even included as a link in the interface for the application, giving direct access to the marketplace. Many security products, email appliances, Linux distributions, as well as a host of other applications are available. As an example, Figure 5 shows the *Zeus Traffic Manager* virtual appliance. A download and unzip is all that is required! How easy can it get!

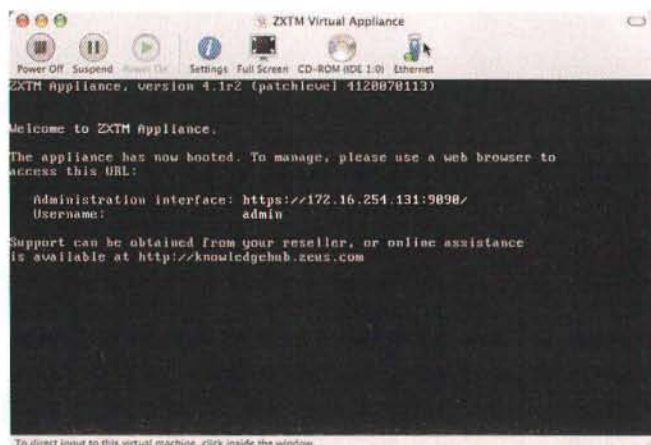


Figure 5

Hardware

VMware also brings its set of tools to the table. It not only installs tools in a virtual Windows environment, but can also install the toolset in Linux and FreeBSD! An RPM file is provided for Linux, as well as a compressed binary file. For FreeBSD, the file is a compressed binary file.

Another added advantage is the inclusion of a 3D video driver. Is it good enough to play video games that require advanced graphics? Probably not, but it is good enough to run programs which require 3D graphics such as AutoCAD. The last advantage is the use of a Gigabit Ethernet connection.

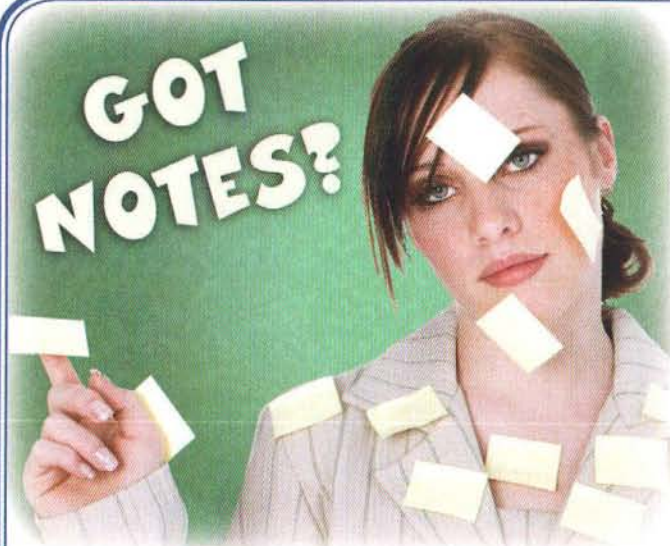
These are some of the features that are unique to VMware today. It is important to also remember that VMware is still months away from a final release, and may or may not gain new features in the interim. Having looked at VMware, let's turn to VMware's main competition, Parallels.

PARALLELS

Parallels provided the first entry into the marketplace of virtualization on a Macintosh. Even though Parallels was the first, many of the features are revolutionary. Let's take a look!

Coherence

The newest addition to Parallels product is termed *Coherence*. From Parallels' description, "With Parallels Desktop for Mac you can now run all the applications you need without switching between Windows and Mac OS X! Coherence, a new



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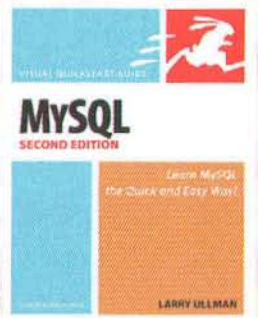


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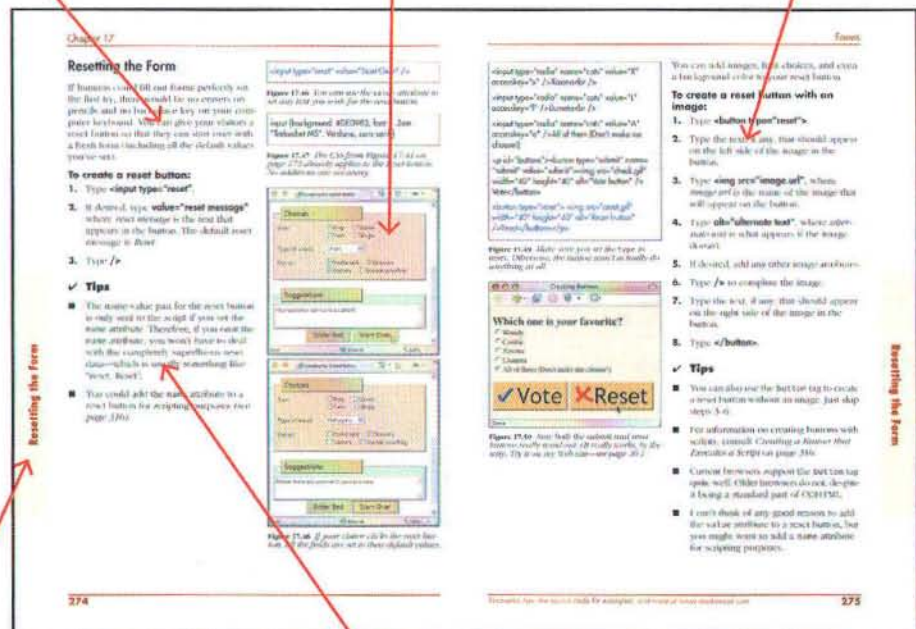
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feature built-in to every copy of Parallels Desktop, shows Windows applications as if they were running natively on your Mac.™ Rather than describe this feature, a screenshot really shows it off quite well.

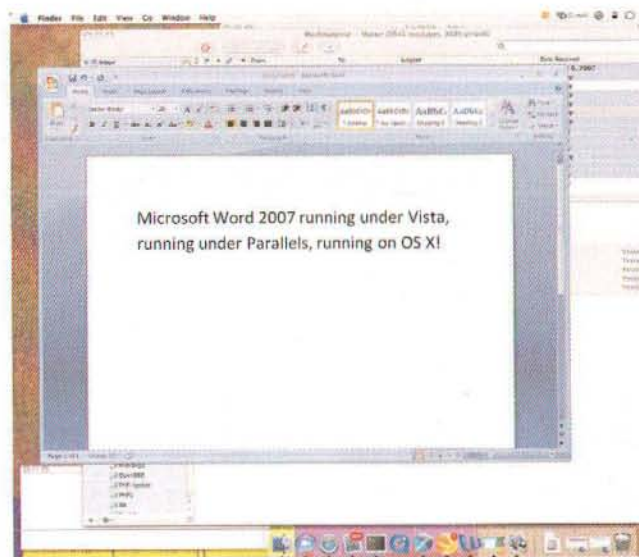


Figure 6 – Windows and OS X co-existing. Note the Finder toolbar, Windows Word and Mail.app all present.

Take a close look at Figure 6. Note the appearance; it appears as if Windows is not running at all! Other nice benefits of this feature are the rounded corners, and the appearance of an icon in the Dock. It truly makes it a much more Mac like experience, and is enabled with a simple click or key combination in the Parallels interface.

Boot Camp

Another of the newest innovative features of Parallels is the ability to use a Boot Camp partition with a simple click during installation. Why is this solution attractive? It is the best of both worlds, as sharing files from Boot Camp is now quite easy. Figure 7 shows how easy it truly is.



Figure 7

The only downside is that the virtual machine cannot be suspended when using a Boot Camp partition as corruption may occur.

Dual monitor support

In my mind, this feature, while not new, is perhaps one of the single best features of Parallels. With two monitors, the virtual machine can be presented full screen on the second monitor. While a bit disconcerting at first, it is attractive to have a full screen virtual machine.

Optimization settings

Parallels also offers options that can be used to enhance performance of a virtual machine.

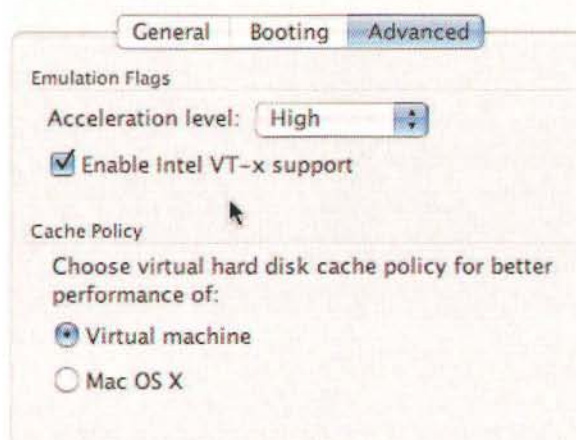


Figure 8

Figure 8 shows the two major options that are available. In the emulation flags, Parallels allows users to choose whether to use VT-x support. What is VT-x? Intel has specifically coded extensions for the new Core Solo and Duo chipsets that overcome some of the limitations of the x86 architecture for virtualization. "Hardware-supported CPU virtualization extensions such as Intel's VT-x allow multiple operating systems to be run at full speed and without modification simultaneously on the same processor. These extensions are already supported in shipping processors such as the Intel(r) Core Solo and Duo processors found in laptops released in early 2006". By tapping into the power of VT-x, any virtual machine can operate at processor native speeds.

Additionally, Parallels allows caching optimizations. The ability to control the hard disk caching policy can affect unnecessary swapping from the virtual hard disk. Many Parallels users have found that this option can enhance performance.

Small things

A number of less notable features also add to Parallels appeal. Need to take a screenshot? Use the menu item. Need a DHCP address range for Shared or Host-only networking? Use the Parallels preferences to assign the desired network ranges. It also includes some of the OS X features that so many have come to love... transitions, icons in the Dock, and miniature screens of running Windows in the dock. The Parallels team has made the best effort it can to make Parallels as Mac-like as possible. These small things are perhaps some of the most attractive features of Parallels for a Mac user.

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Shared features

Some features are common to both Parallels and VMware. Drag and drop functionality is now supported in both virtual environments. Take a file, drag it into the Window and it is copied over. Nice! Both products support dynamic window resizing. Grab the corner of any window and resize. The last feature is the ability to use *Shared* folders. Both products use networking to allow file sharing between the host operating system and the virtual environment. All of these features create a more seamless experience between host and client.

OTHER OPTIONS

CrossOver for Mac

Why consider CrossOver? The single largest reason is that it requires **no** Windows license. Based on the **Wine Is Not an Emulator** project, CodeWeavers has produced a product that supports some of the most popular Windows based applications. Officially, it supports Microsoft Outlook, Microsoft Project, Visio and Office 2000. It supports other applications as well, though to a lesser degree.

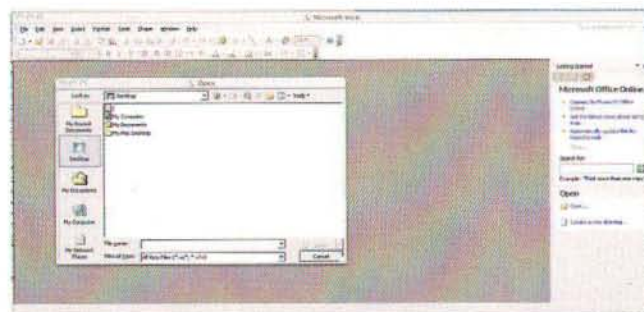


Figure 9

Taking a closer look at Figure 9, note that CrossOver is running in the X11 windowing environment. It does not affect functionality, but simply is worth noting. Additionally, note the Aqua window surrounding the program itself. It is nice to have the interface sufficiently abstracted so that it appears to just be “running” the program.

Which one is right for Me?

This question is becoming increasingly difficult to answer. For a moment however, it may be useful to step back and analyze which product potentially suits your needs. Note that the view provided below is only one writers opinion...

Full Windows environment

If the sole reason one of these solutions is needed were for Windows functionality, I would choose Parallels hands down. Why? Coherence and Boot Camp support. Coherence mode really hides the Windows interface from the desktop, which certainly is very attractive to the end user. Additionally, support for a Boot Camp partition makes file sharing between partitions simpler, as well as allowing the best of either world, a dual boot machine **or** a virtual environment. The user no longer has to choose between the two solutions. It also has the potential benefit of patching and maintaining a Boot Camp solution, without having to reboot the machine, a non-trivial task.

Scientific or non-Windows environment

In this case, my choice would be VMware hands down. Again, why? The reasons here are bit more complex. First, the availability of tools for Linux and FreeBSD is a major advantage. Being able to use the VMware tools as one would in the Windows environment is a major plus. Secondly, often 64-bit and SMP support is needed and desired when running an operating system for scientific applications. The ability to run a virtual environment with both capabilities cannot be underestimated.

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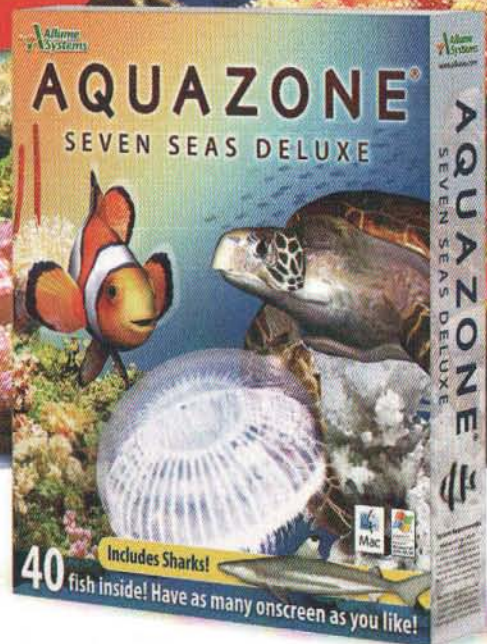
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Single Windows application

If a single application is needed, such as Microsoft Visio, CrossOver may be the best option. Not having to run a full virtual environment and its associated overhead and maintenance can be a huge win. To run the **one** Windows application, why invest in an entire virtual environment? Additionally, by running CrossOver, potential vulnerabilities, adware and malware become a non-issue, as the environment is not a full Windows installation.

The downside

So what are some of the disadvantages of running any of these products? Let's look at CrossOver first. CrossOver's largest disadvantage is the inability to run **any** Windows application. The list of supported applications is quite small, and the application that is needed may not exist. Parallels biggest disadvantage is its relatively new entry into the virtualization market. Some of the features are simply not quite as advanced as one would like. Lastly, VMware's biggest disadvantage is it is still a beta product, and does not have the most Mac-like interface. One possible disadvantage is the pricing for VMware. At the time of this writing, it has not been announced.

The future

The future of virtualization on a Mac has never been brighter! Competition between vendors can only make each product better, as the free market influences features. Other possibilities might even include the ability to run a virtualized OS X environment, or even OS X Server. The sky is the limit!

MI

About The Author

Philip Rinehart is co-chair of the steering committee leading the Mac OS X Enterprise Project (macenterprise.org) and is the Lead Mac Analyst at Yale University. He has been using Macintosh Computers since the days of the Macintosh SE, and Mac OS X since its Developer Preview Release. Before coming to Yale, he worked as a Unix system administrator for a dot-com company. He can be reached at: philip.rinehart@yale.edu.

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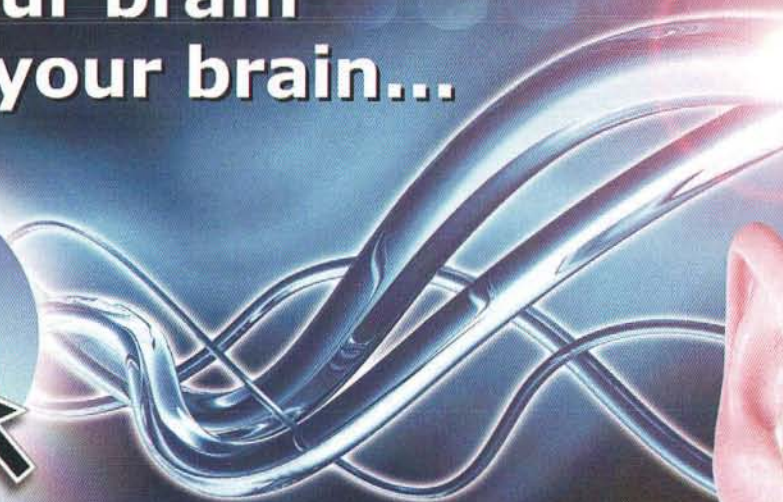
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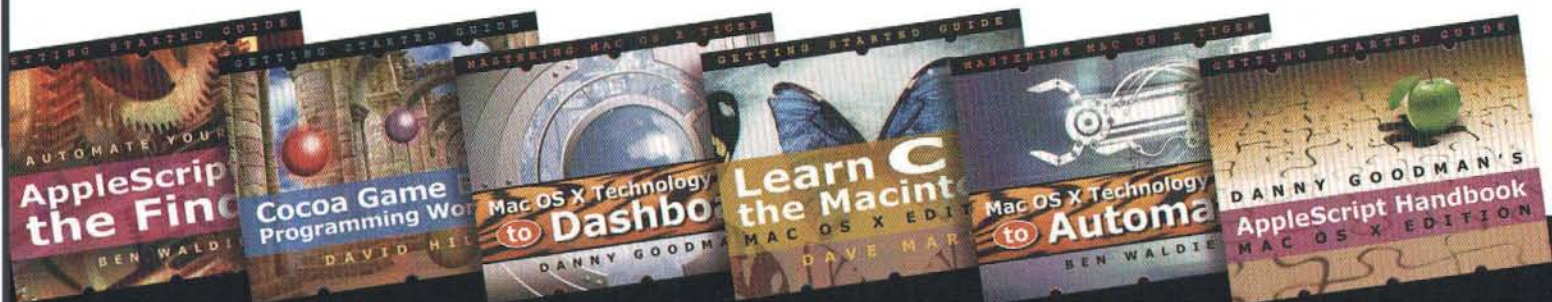


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By Allen Hancock, ACTC

Introduction

Hello again, and welcome to another article about my favorite software. This month: DropCopy.

DropCopy by the fine folks at 10base-t.com is a quick and simple application that will allow a user to easily transfer a file or files to another user in their workgroup. It is free for groups of three or less computers, and \$25 gets you a license good for larger networks.

Users look for the easiest way to get a job done, we know this. When one user needs to send a file to a colleague, the tool they tend to migrate to is e-mail. This is not a huge problem, but if you are anal like me you know that now they have a copy stored in their home directory, a copy in their outbox, a copy in their colleagues inbox, and one more wherever the document is supposed to end up. Multiply this by lots of files, and that one megabyte .pdf is just wasting too much space. Then, if their email server is hosted elsewhere, that is a lot of time wasted uploading and downloading files. The best is when that file is a 15 MB PowerPoint document they are sending back and forth... five times in a day... you get the idea.

Alternatively, they will put a file on the file server telling their colleague "its there". At this point, the colleague needs to stop what they are doing, go find that file, and are they going to remove it from the server? Not usually. Now we have extra files strewn about the server in various stages of completion, and no one person who really knows when it is OK to clean up all the detritus.

Enter DropCopy, saving the day with its little circle:



DropCopy's Drop Zone.

Drag a file there, look for your destination's name in the drop zone, and watch the file move. The file is sent from one computer directly to the other (over port 5052 for anyone running a firewall). The transfer is point to point, sparing both the mail and file server the wasted bandwidth and storage, and delivering the file to the proper colleague in an instant.

But how best to implement DropCopy? Let me begin from the beginning. As with so many applications, if we were to simply install DropCopy and let it go, it would work, but with a little extra setup and tweaking, DropCopy's true strengths shine.

Let's take a trip to www.growl.info. Using Growl will make help our users send files with the knowledge that their files made it safe in a graceful, unobtrusive fashion. Growl is a notification framework, for those of you unfamiliar, and all the cool applications are taking advantage of these good-looking notifications.



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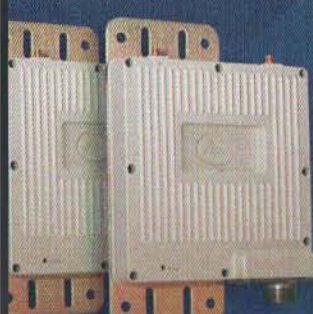
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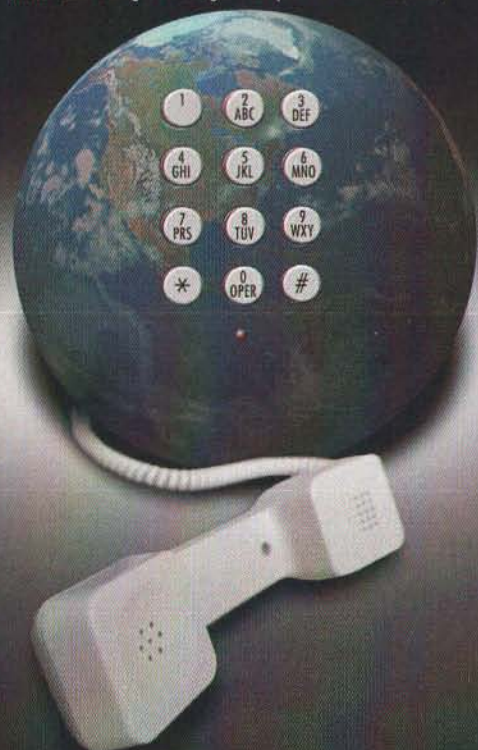
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Incoming File from Accounting:

Big huge file to send

A basic growl notification.

Patiently waiting for me to acknowledge the file.

When I get a file, DropCopy has been instructed to let me know who it is from, and the name of the file. Oh, and did I mention there is no real limit to the size of a single file sent via DropCopy? Very cool. Once I receive a file, I will know just where to find it because of my preferences setup. We will get to those details soon.

Once you have Growl installed, DropCopy's next launch will notify you that it has registered itself with Growl. Take a quick trip to your system preferences, find the Growl Preference Pane, and let's configure the notifications as such:

Enable	Application	Display	Click
<input checked="" type="checkbox"/>	Chax	Default	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	DropCopy	Default	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	Growl	Default	<input checked="" type="checkbox"/>

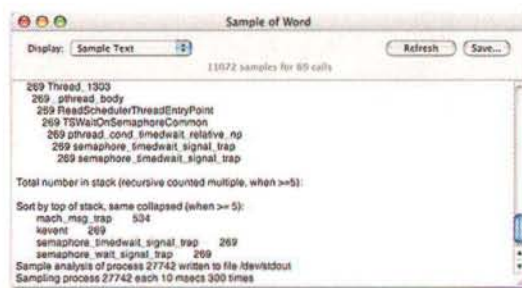
Enable	Notification	Display	Priority	Sticky
<input type="checkbox"/>	go	Default	Default	<input type="checkbox"/>
<input checked="" type="checkbox"/>	incoming	Default	Default	<input checked="" type="checkbox"/>
<input checked="" type="checkbox"/>	sent	Default	Default	<input type="checkbox"/>

My preferred growl settings to get the most of DropCopy

The reasoning behind my oh-so-picky setup? I like a good Speed Racer analogy as much as anyone, but once I know DropCopy is running, I don't want to see its ad every time I restart my computer, so let's turn "go" off. The "incoming" notification, on the other hand, is vitally important. This is the way we are going to know we have received a goody. Let's check the Sticky box here, so that if we are too busy to go look at the file, we can leave the incoming notification on the screen as a reminder we have more work to do. As far as "sent" goes, it is nice to know that we have sent a file, but there is no reason to have to click the notification away, so we are going to leave that notification at the default "only when idle" setting.

This brings us to DropCopy itself, and its plethora of choices..

Does



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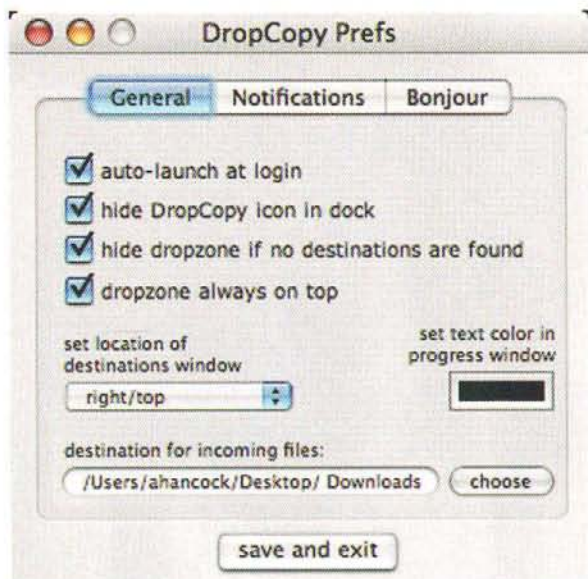
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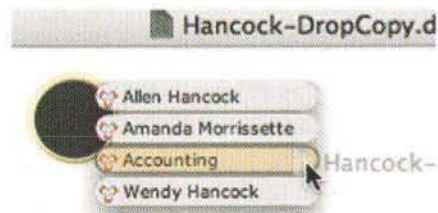


General Prefs, bring 'm on!

The first page is all good. Let's turn all of these on. Launching at login is always good for handy tools. We never need to actually switch to DropCopy, so let's get it out of our dock and Application Switcher. If we are away from the office or burning the midnight oil with no one around to send files to, there will be no reason to see the

dropzone, and my favorite preference in DropCopy: "dropzone always on top."

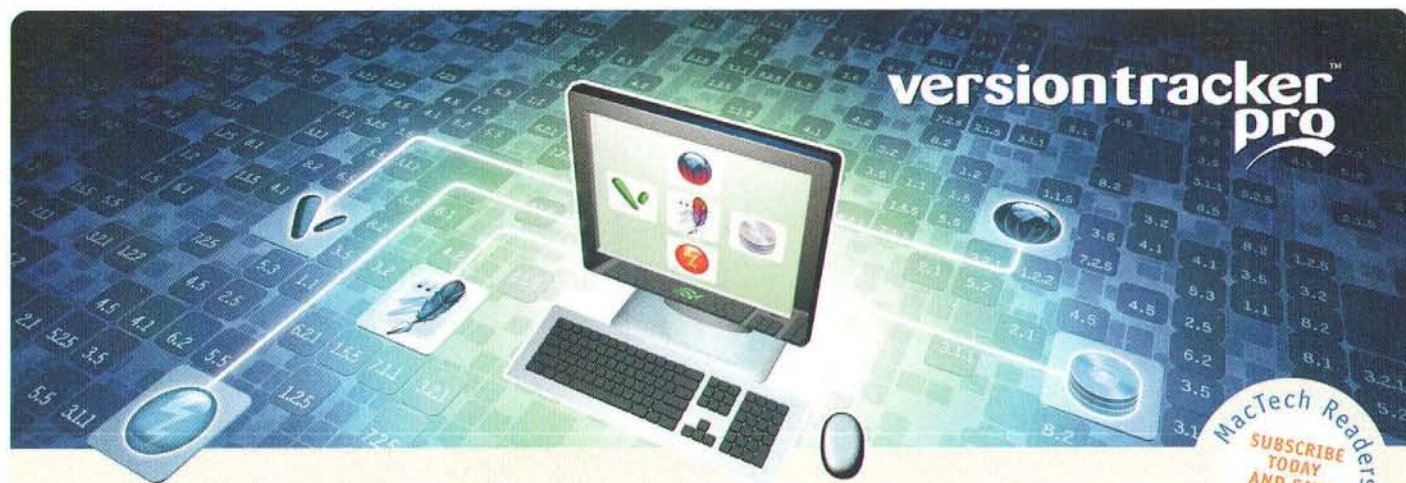
Why is this my favorite? Because if I can see the dropzone at all time, I can use my all time favorite tip: ProxyIcon support.



With the dropzone always visible, just grab your current file's icon and Drop Away!

Once I hit save on my masterpiece, and need to transfer it to someone else, I no longer have to switch to the finder to send a file. Save, then grab that little icon from it the document's Title Bar (the "ProxyIcon"), and drag it over to the dropzone. DropCopy will show you all your available destinations, and away you go. I love this tip: ProxyIcon's rock. Thanks OS X!

There are three more prefs on that first page. The next two, location of the destinations and progress



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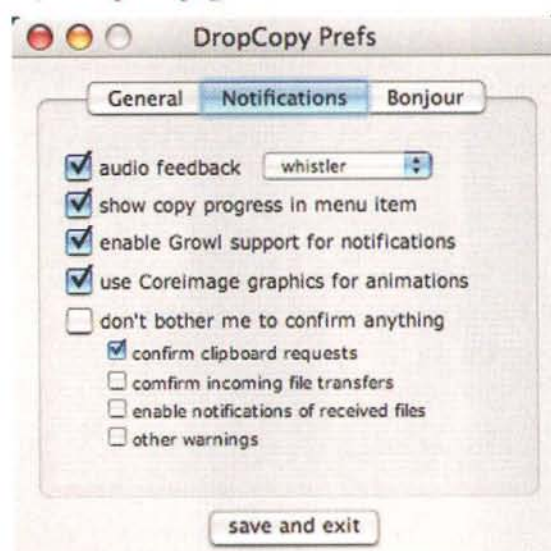
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window color, really are just personal prefs. That last one though, can make or break a user's enjoyment of DropCopy.

I have made it a habit to help users gain control over their desktops by creating a "Downloads" folder. Did you see the leading space there? Now when they are looking at their Desktop in a window, this folder is waiting at the top, ready to go. By creating a specific folder for users to refer to for DropCopy'd files, they don't have to go searching for which file on their desktop was just sent over. This can go one further though, I then offer to update Safari, Firefox, etc to put their downloads in there as well. Chicks dig it. For extra brownie points, set the "Downloads" folder to sort by date modified, and add it to their sidebar. No wonder I like the Mac so much.

Ok, onto prefs page 2



Prefs page 2, as I declare they should be!

When I got started with DropCopy, there was only one noise available. To this day, I like "whistler" best. Showing feedback is always nice, Growl support is a must, as I have mentioned. Coreimage? Take it or leave it, personally I think they are cool. As far as confirmations, I will always want to be asked if someone can have my clipboard, but the rest of the notifications are best handled by Growl, so turn those off lest you be bothered by modal dialogs (a la 1989).

Now page three's prefs are very interesting indeed. Normal users will never have to venture into here, but I have really enjoyed some of these options. Have two computers on your network with your name on the current user? Rename one! You can see in earlier screenshots I have one called "Accounting". How about calling that MacMini of yours "Media Center" and you can send your encoded, home made, movies to

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without ever having to mess with file sharing. There are a number of cool things you can do with these preferences, especially in concert with the DropCopy menu.

Text messaging? Clipboard sharing? Look in DropCopy's Tools menu for SFTP locations too. How cool!

I could go on, but this is enough to get the point across about what a great tool DropCopy is. The only thing that could make this better would be cross-platform support. There is hope though, the developers have documented the protocol and have given it others. So if you like this, and have the wherewithal to code a nice windows or linux application, drop them a line and let's see if we can get broader platform support to this wonderful, simple to use application.

I always believed that it is the little things that make all the difference, and time after time my clients have told me that this little gem is that difference.

Happy DropCopying!

MI

About The Author

Allen Hancock has been providing on-site and remote based support based in Baton Rouge, Louisiana since 1997. When not being persnickety over details, he spends time with his wife and son. Of course, they might want to know just when that is :-). He can be reached through his website www.hancockconsulting.net



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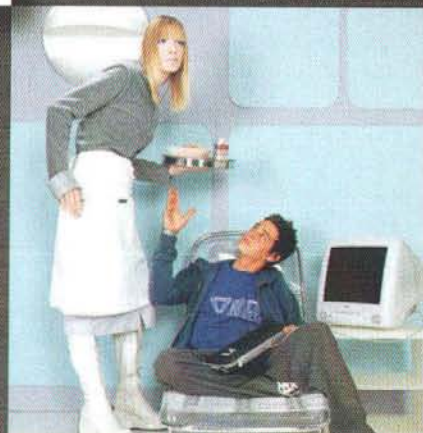
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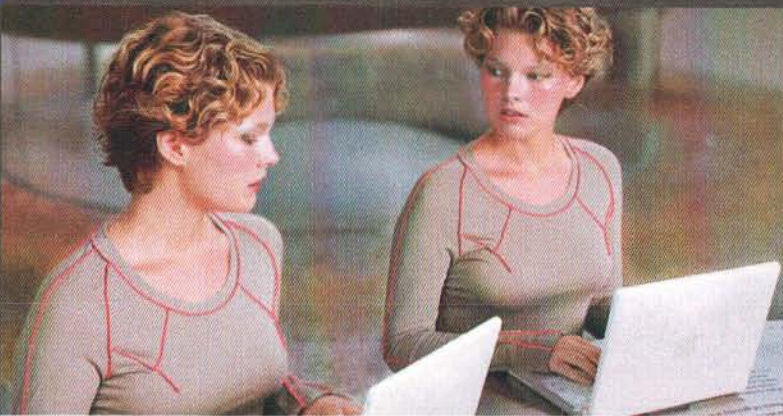
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REAL WORLD REVIEW

by Michael R. Harvey

Myvu Personal Media Viewer

Carry a big TV around with you and your iPod

The one bad thing about the fifth generation iPods with video is that the screen is really too small for watching video, and doesn't lend it self to viewing for long periods of time. It just kind of sucks when you try it. There are a couple of products just coming out that solve the problem, and one of our favorites is the myvu personal media viewer from MicroOptical. We got our first look at myvu when it was announced and demonstrated at the 2006 Macworld Expo. It was finally released in December, and looked to get a good reception again in San Francisco this past January.

As you can see in the image above, the myvu looks pretty much like a pair of sunglasses that have been wired up. What those sunglasses do essentially is display in front of your eyes



the equivalent of a 27" television as seen from six feet away. The effect is amazing, and very watchable. The glasses don't completely block your view, however. You can still see around and over the display. You may find this either good or bad, but in our testing, seeing over the display was only minimally distracting when there was a lot of activity going on nearby. Using them sitting in an aircraft seat was no problem.

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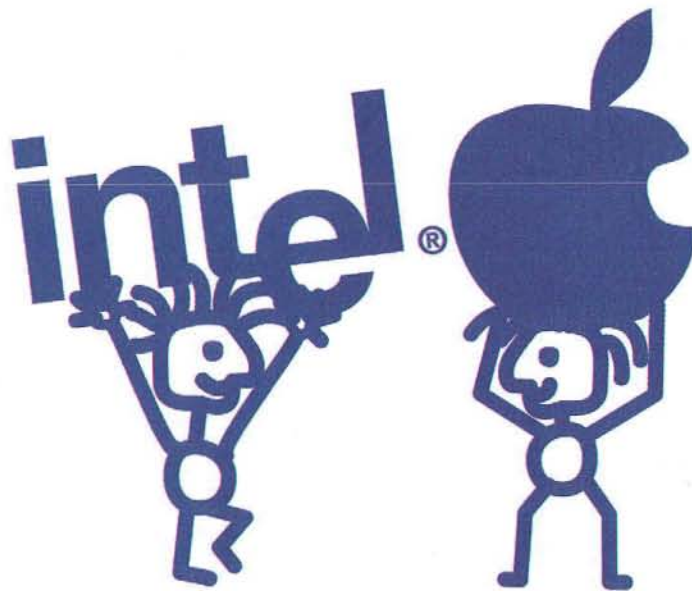
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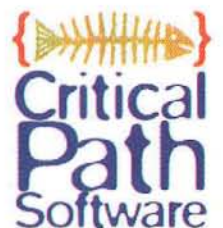


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The head set has some really good sound isolating ear buds integrated into them. The unit comes with several different sized pads to fit your ear canals, and are very comfortable. They are very much like the ones Shure has on it's line of ear buds. Sound quality is quite nice,, better than you'd get from a real 27" television.

The head set unit is very light- weight and comfortable sitting on your facewhile being worn. The cable that trails off to go to the iPod runs off the back of your left ear, keeping it out of the way. There are several different sized nose clips that are each adjustable, to help customize the fit even further. For those with prescription glasses, an insert can be ordered from the myvu web site that will fit in front of the display.

The cable running off the glasses has a control pad about mid-way down its length. It has controls for volume, forward, back, play/pause, and brightness. From there, there cable plugs into the battery unit (the included wall wart and car chargers also plug in the dock connector on the end of the cable). Another dock connector links the battery to the iPod. The battery unit is also a protective case that will hold either the 30, 60, or 80 GB 5th generation iPods quite nicely. In fact, MicroOptical should think about releasing just the battery as a stand- alone product, as they've done that bit better than most every other external battery out there today.

Wrapping up the hardware is a good quality protective case, a soft cloth pouch to hold the head set, and a detachable belt clip for the battery pack. That's it.

Out of the box, the unit works with the iPod with only one settings change needed. Under Videos : Video Settings, the TV

Out option needs to be set to on. Nothing more. Everything else works exactly as you would expect.

Only a couple negatives to point out. One that we found kind of silly was that a CD was included with a trial version of M2Convert, a Windows only program for converting DVDs to a format for the iPod. Considering it's for an Apple product, where's the Mac demo app? The other thing we found by accident was that if the battery pack is left plugged in to the iPod, and the glasses into the battery, the iPod will drain it quickly - w. Within a couple days. For some reason, the iPod would repeatedly kick the backlight on, draining its battery, and subsequently drain the myvu battery to keep itself charged. Once the myvu battery was dead, the behavior stopped. We didn't notice the behavior when it was just the iPod and the battery connected. The moral is: don't leave the glasses plugged in when not using them.

Overall, the myvu glasses are an outstanding product. If you travel at all, or like using your iPod to watch video, then the myvu will become a must have accessory. It really does the job better than anything else we've seen out there thus far. Retail price is \$299 direct from MicroOptical, and at a few retailers. The prescription inserts cost \$99. Eye care professionals that sell them can be found on the site.

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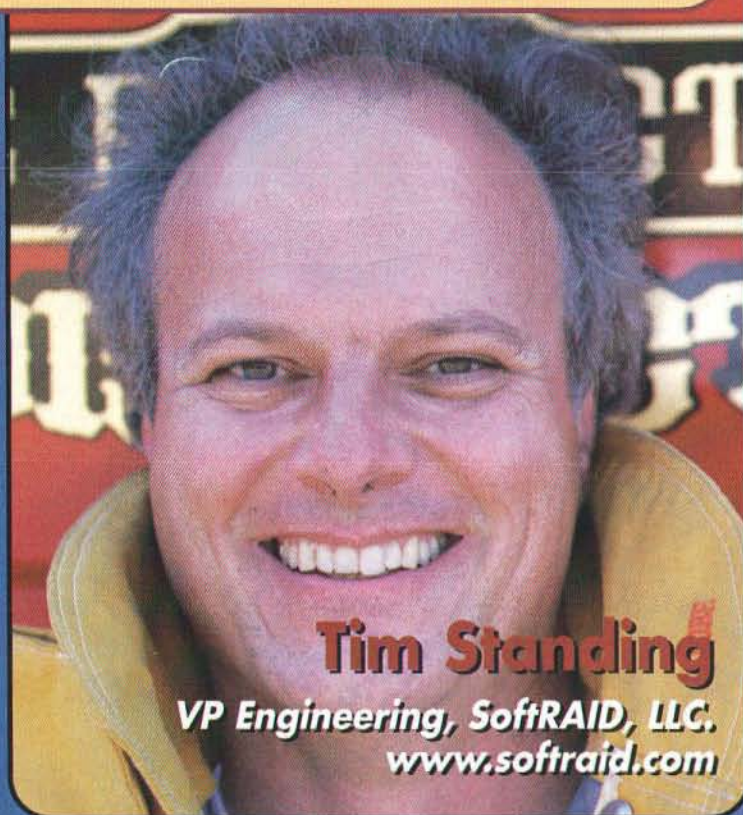
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What do you do?

I write most of the SoftRAID code and help figure out the future product directions. I am also part of the team which designs the UI for our products. We always story board the entire interface before we write any code. This was one of the gems I picked up from Bruce Tognazzini's book "Tog on Interface".

How long have you been doing what you do?

I started writing code in high school back when our high school had just received a teletype terminal and a 110 baud modem for accessing the mainframe at UC Berkeley. Larry Zulch (who started Dantz Development with his brother) and I used to write programs in basic on that terminal. I used computers only as a user for the next 10 years. Then, when I was in graduate school biochemistry in Boston, I decided to take night school classes to learn about assembly language and how computers actually worked. That was the fall I bought my 128 KB Mac. I took VAX assembly language followed by a class in 68000 assembly language. After that, computers really came alive for me. For the next four years, I worked biochemistry during the day and learned all I could about computers the rest of the time. Then in 1988, I started writing code for a living.

Your first computer:

A 128 KB Mac.

Are you Mac-only, or a multi-platform person?

When I was consulting 8 years ago, I wrote drivers and applications for Mac OS, Linux and Windows. Now that I am working for my own company, I can afford to work only on the platform that inspires me.

What's the coolest thing about the Mac?

The attention to detail which Apple and 3rd party developers apply when creating hardware and software products for the Mac. When I use other platforms, I am always amazed at the bugs and confusing UIs that users have to put up with.

If I could change one thing about Apple/OS X, I'd:

Fix the incredible number of bugs in XCode. It seems like each new release introduces new bugs. Most bugs seem to take 12 - 18 months to get fixed. They keep introducing new features rather than fixing bugs. Arrgh.

What's the coolest tech thing you've done using OS X?

I tracked down and fixed a bug in the SoftRAID driver which occurred every 20,000,000 i/os. It was a bug which we saw in house every 2 - 4 months. We finally found a user halfway around the world who could reproduce it in 12 - 18 hours. I put together a set of tools to figure out the root cause of the bug. In less than a week, we had the bug isolated and a fix in place. The bug turned out to be caused by an "undocumented feature" in the kernel's atomic add routine.

Ever?

I wrote the driver for the Asante SCSI-Ethernet adapter. The device didn't contain a CPU or a SCSI chip, just a couple of PALs (simple logic devices) which sensed the state of the SCSI control and data lines. To get the device to work reliably and have good performance, I wrote a set of SCSI routines which worked in parallel with the original SCSI Manager.

Where can we see a sample of your work?

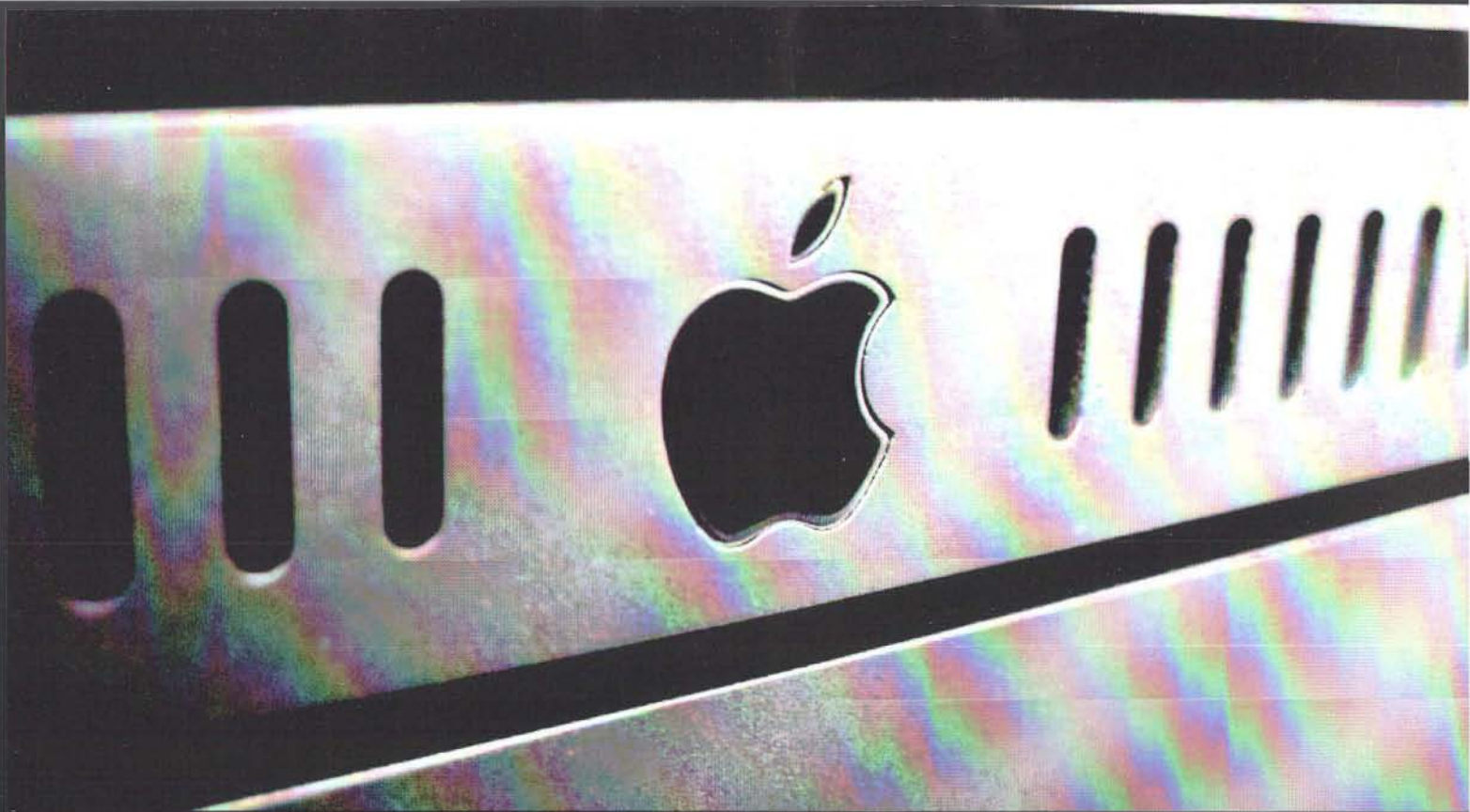
<http://www.softraid.com/demo>

The next way I'm going to impact IT/OS X/the Mac universe is:

We have a really cool product under development for portable storage devices. I can't wait to be using it myself. I'm unable to say any more.

Anything else we should know about you?

I love my work and the challenges it provides. The other major passion I have is being a volunteer fire fighter. I started 3 years ago, and the experience has been one of the most moving and rewarding things I have ever done. I do about 150 calls a year most of which are medical; there are a few traffic accidents and even fewer fires. There is something very surreal about going to work on computers in the morning after getting up in the middle of the night to pull someone out of a wreck.



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